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# FLUOR

March 29, 2006

Fernald Closure Project  
Letter No. C:CPD:2006-0003

Mr. Johnny W. Reising, Director  
U. S. Department of Energy  
Ohio Field Office – Fernald Closure Project  
175 Tri-County Parkway  
Cincinnati, Ohio 45246

Dear Mr. Reising:

**CONTRACT DE-AC24-01OH20115, TRANSMITTAL OF THE SILOS AREA NATURAL  
RESOURCE RESTORATION DESIGN PLAN, FINAL, REVISION 0**

Enclosed is the Silos Area Natural Resource Restoration Design Plan (NRRDP). The NRRDP was prepared as the guiding document for restoration of the Silos Remediation footprint, the Pilot Plant Drainage Ditch and the areas immediately north. Included within the plan are detailed restoration grading and planting plans.

Restoration grading in the majority of the areas included in this NRRDP will not be initiated until April 2006. The final phases of the Silos Area Restoration Project (i.e., the footprint of the Tank Transfer Area and Silos Treatment Facility) are currently scheduled for June 2006 and are currently the last scheduled restoration activities at the site. To the degree possible, restoration of surrounding areas will be accelerated.

Upon your concurrence, please forward to the U.S. and Ohio Environmental Protection Agencies. If you have any questions or require additional information, please contact Jyh-Dong Chiou at (513) 738-2834 or Eric Woods at (513) 478-1547.

Sincerely,



Cornelius M. Murphy  
Closure Project Director

CMM:EW:JH:ldt

Enclosure

cc: With Enclosure

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# **SILOS AREA NATURAL RESOURCE RESTORATION DESIGN PLAN**

**FERNALD CLOSURE PROJECT  
FERNALD, OHIO**



**MARCH 2006**

**U.S. DEPARTMENT OF ENERGY**

**20600-PL-0007  
REVISION 0  
FINAL**

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## LIST OF ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	Department of Energy
FCP	Fernald Closure Project
NRRP	Natural Resource Restoration Plan
NRRDP	Natural Resource Restoration Design Plan
PPDD	Pilot Plant Drainage Ditch

## 1.0 INTRODUCTION

Ecological restoration activities at the Fernald Closure Project (FCP) are required per the requirements of the Natural Resource Restoration Plan (NRRP) (DOE 2002). The NRRP was developed to define the final site configuration, including surface contours, drainage patterns and vegetation plans for the FCP. The NRRP was developed to meet various regulatory requirements (e.g., Clean Water Act) and as part of a tentative agreement for resolution of natural resource damage liability under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This Natural Resource Restoration Design Plan (NRRDP) provides the detailed design and specifications for conducting restoration activities within the Silos Project footprint and surrounding areas.

This Silos Area NRRDP is consistent with the sitewide ecological restoration goals set forth in the NRRP (DOE 2002). Restoration goals include the establishment of additional wetlands and ponds, expansion of the contiguous prairie areas being established in the Former Production Area and the establishment of pre-settlement native plant communities to expand the riparian corridor along Paddys Run.

The Silos Area project boundaries are shown on Sheet G-1 of the attached construction drawings. The Silos Area project encompasses approximately 48 acres of the former Silos Remediation Project footprint and adjacent areas to the north and south. Restoration of the Silos Area will focus on the enhancement and creation of wetlands and open water habitats. Approximately 5 acres along Paddys Run will be planted with native trees and shrubs. Surrounding areas will be seeded as prairie, which will be contiguous with the prairies established in the Former Production Area.



## 2.0 SITE DESCRIPTION

### 2.1 SILOS AREA SITE DESCRIPTION

The Silos Area project encompasses approximately 48 acres immediately west of the Former Production Area and south of the former Waste Pits Area. Remediation of the Silos Area included removal of the silos and their contents, stabilization of the waste, and off-site disposition of the stabilized waste. Soil under the former Silos footprint and treatment facilities was excavated and disposed of in the on-site disposal facility (OSDF). Upon completion of soil remediation, the soil certification process will be completed to ensure that final remediation levels in the remaining soils have been met. Restoration work will be initiated after soil sampling, analysis and data validation associated with soil certification is complete.

The Silos Area project also includes the areas immediately north of the Silos Area project footprint, including the former bio-surge lagoon and surrounding area. This area was included with the Silos Area NRRDP due to the connection of drainage patterns in this area with the silos area. Drainage patterns require that the area be designed as one project since runoff from much of the area around the bio-surge lagoon will drain south into the Silos Area project footprint. The area north of the Silos Area footprint was also included in the NRRDP due to the timing of the areas becoming available for Restoration. These areas will be among the last areas becoming available for restoration.

Due to the extent of the excavation west of the Silos Area, restoration work addressed in this NRRDP will also include the stabilization and vegetation of a portion of the east bank of Paddys Run. The Pilot Plant Drainage Ditch (PPDD) is located immediately south of the Silos Area footprint and will also be enhanced through the planting of trees and shrubs as part of this NRRDP.

### 3.0 COMPONENTS OF RESTORATION

#### 3.1 SILOS AREA RESTORATION COMPONENTS

Restoration components for the Silos Area project are illustrated on Sheets G-1 through Sheet G-3. A brief description of the components of restoration for each area is provided below.

##### 3.1.1 Creation of New Wetlands

A key component of the Silos Area Restoration Project will be the use of various depressions left after excavation to create new wetland and open water habitat. A similar approach is currently being implemented in the Former Production Area and the Waste Pits Area at the FCP. Several depressions will remain from remedial actions in the Silos Area (Sheet G-2 and G-3). Depressions remaining after remediation will be converted to wetland areas to the maximum extent possible. The construction of restored wetlands will be carried out in a manner consistent with past wetland creation at the site.

Vegetation of wetland areas will include the installation of dormant willow cuttings for erosion control in spillways. Wetland areas will also be seeded with the native wetland seed mix per the specification outlined in Appendix C. Wetland soil (i.e., pond muck) from established, on-site wetland areas will be imported into restored wetlands consistent with past practices to help boost the establishment of wetland plants and insects.

In the event that the Silos Treatment Facility Pad and the Tank Transfer Area Pad cannot be confirmed clean and the pads have to be completely or partially removed, additional wetland acreage could be created in the footprint of the former pads. Drainage patterns will be adjusted so that the wetland areas can outfall to the PPDD.

##### 3.1.2 Prairie Establishment

Additional prairie areas will be established around restored wetlands in the Silos Area. The footprint of the Silos Area project, including the area to the north, will be a series of wetland areas with surrounding upland areas restored as prairies. These prairie areas will be an extension of the prairies being established in the Former Production Area. Upland areas to be restored as prairie will require soil amendment as outlined in Section 4.2 and will be seeded per the specification provided in Attachment C.

### 3.1.3 Riparian Corridor Expansion

Restoration of the Silos Area will include the enhancement of the wooded corridor along the PPDD and Paddys Run. Several areas along the PPDD and Paddys Run have been disturbed due to required excavation and/or removal of debris. Native trees and shrubs will be planted in select areas along Paddys Run and the PPDD to restore and expand the riparian corridor (Sheets G-5).

### 3.1.4 Beneficial Reuse of Concrete Pads

The former Silos Treatment Facility Pad and Tank Transfer Area Pad will be sampled to confirm that they have remained clean during remediation. Upon Agency concurrence, the pads (or the portions of the pads remaining clean) will be left in place for beneficial reuse. The pads will be used to develop support areas for the Multi-Use Education Facility (MUEF). The pads will provide a foundation to develop parking and turn-around areas, outdoor displays and an elevated viewing platform for restored areas at the FCP. Detailed design of the displays, viewing platform and parking configuration will occur as part of the MUEF design. In the event that a portion of the pad is determined not clean and requires excavation, the excavated area will be graded to blend in with adjacent restored areas and will be appropriately seeded, if not converted into a wetland area as indicated in Section 3.1.1.



#### 4.0 FIELD IMPLEMENTATION FOR SILOS AREA

This section describes the activities that will be undertaken to implement the ecological restoration components discussed in Section 3.0. Restoration activities in the Silos Area will focus on the establishment of open water and wetland areas and expansion of the riparian corridor. There are four main phases of implementation; site prep, grading activities, vegetation installation, and maintenance activities. Each of these phases is discussed in more detail below.

Field work will be conducted by Fernald Building Trades personnel. All activities will be undertaken in accordance with Module 1 and 2 of the Soils Excavation and Onsite Disposal Facility Construction Work Activities Traveler (Traveler). The Traveler describes the health and safety requirements for all restoration activities at the FCP. Field personnel will be briefed on the Traveler modules as well as this NRRDP prior to commencement of field activities. In addition, Project Management will ensure that the requirements of the Soil and Disposal Facility Project Integrated Health and Safety Plan (20100-HS-0002, Rev. 1) are met. The project Restoration Ecologist and Restoration Construction Manager will provide technical direction and oversight of field personnel.

##### 4.1 SITE PREP

Site prep involves activities necessary to prepare for grading, seeding, erosion control and native plant installation. Typically, this would include the establishment of access points and construction area boundaries, clearing existing vegetation, and setting up staging areas. Most of the project area has undergone extensive remediation. Construction boundaries will correspond with certification area boundaries. Therefore, construction boundaries and access points are usually already established through the certification process. Entry into the project area will be controlled through the constructed access point. All personnel and equipment entering the Silos Area project must comply with site procedure EP-0008, Access To and Management of a Certified Area (CA). This procedure requires that any equipment entering a certified area is cleaned of potentially uncertified dirt and mud prior to entry. The project area will have additional requirements for entry if the access point is accessible only through a radiologically controlled area. Field personnel will work closely with Radiological Control to ensure that all controlled access requirements are met.

Material and plant stock staging areas will be established as close to the project area as possible. Staging areas will usually be located in the field, on level, accessible ground. The staging area will be fenced in order to protect plants from deer browsing. All plants will be healed in with mulch to prevent the roots from drying out and to protect them from the cold.



## 4.2 GRADING ACTIVITIES

Field implementation of grading and soil amendment application is the responsibility of the Restoration Construction Manager. Any field changes to grading plans based on site conditions or unforeseen circumstances will be approved by the Restoration Ecologist in consultation with the Construction Manager.

Grading activities will involve two phases. For the first phase, restoration grading will be completed according to the specifications on Sheets G-2 and G-3. The grading plan uses the topography that resulted from the remediation excavation as a guide to creating open water areas and wetlands. The slopes of the basins will be graded to no more than 5:1.

For the second phase, soil amendments will be added to soil as needed. Soil amendment prior to planting will be completed as necessary in the Silos Area (Sheet G-8 through G-10). After ripping the soil approximately 18 inches deep, compost will be spread on the berms between the basins and on the slopes of the basins and tilled into the existing soil. Mature compost will be spread approximately four inches thick across all accessible areas. Fertilizer and mycorrhizae inoculant will also be added to upland areas as needed. A mechanical tiller, disc or similar method will be used to incorporate the compost into the top eight inches of existing soil. This process is consistent with current U.S. Environmental Protection Agency guidance (U.S. Composting Council 2004) and has been implemented successfully in other areas of the FCP. The areas planned as wetlands will have compost spread over the bottom of the basin, however the compost will not be tilled into the existing soil. This approach will maintain the integrity of the compacted basins. Sheets G-1 through G-3 show the locations of the wetland areas. Instead, the compost will be spread and tracked/compacted using heavy equipment (e.g., bulldozer), similar to methods used in the Former Production Area. Open water or pond areas will not have compost applied.

## 4.3 VEGETATION INSTALLATION

The use of native vegetation to enhance the riparian corridors adjacent to the Silos Area is one of the goals of this NRRDP. Planting plans are included on Sheets G-5 through G-7. Planting will be focused in the PPDD and Paddys Run to enhance the existing riparian corridors (Sheets G-5). Some shrub patches will be concentrated around the wetland areas created in the project area (Sheet G-5). Native grasses and wildflowers will be seeded across prepared seedbeds. Lastly, herbaceous wetland plant plugs and/or dormant willow cuttings will be installed within wetland features. Implementation of these methods is discussed in more detail below.

### 4.3.1 Woody Vegetation

Planting activities involve the installation of 825 trees and 450 shrubs across the area (Table 4-1). The majority of trees and shrubs will be installed along the PPDD and the east bank of Paddys Run. The trees and shrubs will be installed in the same manner as other ecological restoration projects at the FCP.



**TABLE 4-1**  
**SILOS AREA PLANT LIST**

Form	Function	Coefficient of	Shade	Qty.	Patch		
					1	2	3
canopy	cover	0	low	23		10	13
canopy	cover	0	high	64	25	25	14
canopy	cover	-3	intermediate	6	3		3
canopy	cover, mast	4	high	70	30	30	10
canopy	cover	2	low	9	5		4
canopy	cover, mast	0	high	31	16	15	
canopy	cover, mast	4	intermediate	22	5	5	12
canopy	diversity	3	intermediate	2	2		
canopy	cover, mast	3	high	110	50	50	10
canopy	cover	3	low	21	7		14
canopy	cover	-3	high	89	39	30	20
canopy	diversity, mast	3	low	17	5	7	5
canopy	cover, aesthetics	3	low	13	4	4	5
canopy	cover, aesthetics	-2	intermediate	38	15	8	15
canopy	cover, erosion	0	low	46	15	15	16
canopy	fruit	3	low	11	5		6
canopy	cover, mast	4	intermediate	18	9	9	
canopy	cover, mast	-4	intermediate	12	6		6
canopy	diversity, mast	0	low	2	2		
canopy	cover	-3	low	31	10	5	16
canopy	diversity	5	intermediate	3	3		
canopy	cover, mast	4	intermediate	17	12	5	
canopy	diversity, mast	-1	low	10	3	4	3
canopy	cover, mast	5	intermediate	3	3		
canopy	cover, aesthetics	3	high	8	5	3	
understory	diversity	2	high	41	15	21	5
understory	fruit, diversity	2	high	14	7	7	
understory	diversity	0	high	2	2		
understory	cover, aesthetics, edge	4	high	13	7	6	
understory	cover, edge	0	intermediate	10	4	3	3
understory	aesthetics	4	high	12	6	6	
understory	cover	1	high	49	24	20	5
understory	cover	3	high	6	3	3	
understory	aesthetics, diversity	3	high	6	3	3	
understory	diversity	4	high	2	2		
shrub	diversity	4	high	18	9	9	
shrub	diversity	4	intermediate	9	9		
shrub	cover	1	intermediate	12	6	6	
shrub	aesthetics	-4	intermediate	7	3		4
shrub	cover	-2	intermediate	27	17	10	
shrub	diversity, edge	-2	low	74	25	25	24
shrub	cover, aesthetics	5	low	16	3		13
shrub	aesthetics, edge	5	low	17	7		10
shrub	aesthetics	5	low	21	7	7	7
shrub	diversity	3	low	21	14		7
shrub	erosion, fruit	-2	low	17	10		7
shrub	diversity	0	high	79	30	30	19
shrub	diversity	5	intermediate	20	10	5	5
shrub	diversity, edge	5	high	19	9	5	5
shrub	diversity, edge	3	na	87	30	30	27
Total saplings:				825	349	291	185
Total shrubs:				450	192	130	128
Grand total:				1,275	541	421	313



Planting areas (patches) will be established in the Silos Area (Sheet G-5 and Appendix A). Each planting patch will be laid out in the field and color-coded. The plants themselves will be staged at a central location and tagged with a corresponding colored patch code. Field personnel will then simply match the plant/patch codes and install the plant pursuant to the planting specifications in Appendix B. This "random patch" method allows the Restoration Ecologist to strategically place specific species based on its habitat requirements, distribution patterns, exposure, topography, deer pressure, hydrology, soils, etc. Plantings will be located away from areas that may be disturbed by future remedial or restoration activities.

A total of 2,000 seedlings will also be installed within the Silos Area project (Table 4-2). All seedlings will be planted in either the PPDD or Paddys Run as part of the riparian corridor enhancement.

All plant material has been procured from local sources to the degree possible. All trees and shrubs shall be at least one-gallon container size, grown in "spin out" containers to prevent root binding. Certain species may not be available locally, if at all, and substitutions may be necessary. The Restoration Ecologist will determine the appropriate substitution for a plant. The function of the tree as listed in Table 4-1 and Table 4-2 will be used as a guide to determining substitutions.

#### 4.3.2 Seeding and Erosion Control

With the exception of open water areas, restored areas will be seeded pursuant to the seeding specification (Appendix C). The seed mixes are shown on Table 4-3. The mesic seed mix will be used on all upland areas. The wet seed mix will be used around all open water areas and within wetlands and spillways. A seed drill will be used where possible. Areas inaccessible to the seed drill will be seeded by hand using the broadcast method or seeded with seed paper (biodegradable paper-like product with seed embedded).

If erosion control matting and/or coir logs are required, installation will take place immediately following seeding pursuant to the specifications in Appendix C. The need for matting on additional slopes and swales will be determined in the field by the restoration ecologist.

Excavation activities have impacted the streambank of Paddys Run immediately west of the Silos Project footprint. Restoration of the Silos Area will include the stabilization of the east bank of Paddys Run. An overflow from the former Silos 1 and 2 footprint will be installed to allow drainage from the wetland areas to be created in the Silos Area into Paddys Run during significant storm events. Disturbed areas along the streambank of Paddys Run, either from past excavation or the installation of the spillway, will be stabilized using bioengineering practices implemented in other areas of the site (e.g., coir matting, coir logs). The use of rip rap to stabilize the streambank will be necessary due to the dynamic nature of Paddys Run, but will be supplemented with bioengineering techniques where practicable.

**TABLE 4-2**  
**SILOS AREA SEEDLING LIST**

Species	Common Name	Qty.	Patch		
			1	2	3
<i>Acer rubrum</i>	Red Maple	160	80	80	
<i>Acer saccharinum</i>	Silver Maple	48	24	24	
<i>Acer saccharum</i>	Sugar Maple	280	150	80	50
<i>Aesculus glabra</i>	Ohio buckeye	160		80	80
<i>Carya cordiformis</i>	Bitternut Hickory	24	24		
<i>Carya laciniosa</i>	Shellbark Hickory	24		24	
<i>Carya ovata</i>	Shagbark Hickory	24		24	
<i>Cercis canadensis</i>	Redbud	96	48	24	24
<i>Fagus grandifolia</i>	Beech	312	150	100	62
<i>Fraxinus americana</i>	White Ash	216	100	66	50
<i>Fraxinus pennsylvanicum</i>	Green ash	80	40	40	
<i>Juglans nigra</i>	Black Walnut	72	50	22	
<i>Liriodendron tulipifera</i>	Tulip Poplar	40	20	20	
<i>Prunus serotina</i>	Black Cherry	96	36	30	30
<i>Quercus alba</i>	White Oak	72	25	25	22
<i>Quercus palustris</i>	Pin Oak	80	40	20	20
<i>Quercus rubra</i>	Northern Red Oak	72	25	25	22
<i>Tilia americana</i>	American basswood	144	48	48	48
<b>Total:</b>		<b>2,000</b>	<b>860</b>	<b>732</b>	<b>408</b>



**TABLE 4-3  
SILOS AREA  
MASTER SEED LIST**

Species	Common Name	Coefficient of Wetness	Mesic	Wet
<b>Graminoids (lb/ac unless otherwise noted)</b>				
<i>Andropogon gerardi</i>	big bluestem	1	3	3
<i>Andropogon scoparius</i>	little bluestem	4	2	
<i>Bouteloua curtipendula</i>	side-oats grama	5	0.5	
<i>Calamagrostis canadensis</i>	blue joint grass	-5		0.5
<i>Carex hystericina</i>	porcupine sedge	-5		1 oz/ac
<i>Carex jamesii</i>	grass sedge	5		
<i>Carex normalis</i>	large straw sedge	3		
<i>Carex vulpinoidea</i>	fox sedge	-5		1 oz/ac
<i>Diarrhena americana</i>	beak grass	-1		
<i>Elymus canadensis</i>	Canada wild rye	2	25	25
<i>Elymus hystrix</i>	bottlebrush grass	5		
<i>Elymus riparius</i>	riverbank wild rye	-3		
<i>Elymus virginicus</i>	Virginia wild rye	-2		5
<i>Lolium multiflorum</i>	annual rye	ni		
<i>Panicum virgatum</i>	switchgrass	-1	0.5	0.5
<i>Scirpus atrovirens</i>	dark green bulrush	-5		1 oz/ac
<i>Sorghastrum nutans</i>	indian grass	2	2	
<i>Spartina pectinata</i>	prairie cordgrass	-4		1
na	Regreen	ni	5	5
<b>Forbs (1.5 lb/ac uniform mix unless otherwise noted)</b>				
<i>Anemone virginiana</i>	thimbleweed	ni		
<i>Aquilegia canadensis</i>	eastern columbine	0		
<i>Asclepias incarnata</i>	swamp milkweed	-5		x
<i>Asclepias tuberosa</i>	butterflyweed	5	x	
<i>Aster cordifolius</i>	blue wood aster	ni		
<i>Aster divaricatus</i>	white wood aster	ni		
<i>Aster laevis</i>	smooth aster	5	x	
<i>Aster macrophyllus</i>	bigleaf aster	ni		
<i>Aster novae-angliae</i>	New England aster	-3		x
<i>Baptisia australis</i>	blue false indigo	5	x	
<i>Cassia fasciculata</i>	partridge pea	4	x	
<i>Cassia hebecarpa</i>	wild senna	-3		x
<i>Caulophyllum thalictoides</i>	blue cohosh	ni		
<i>Cimicifuga racemosa</i>	black cohosh	ni		
<i>Echinacea purpurea</i>	purple coneflower	5	x	
<i>Eryngium yuccifolium</i>	rattlesnake master	-1	x	
<i>Eupatorium maculatum</i>	spotted Joe pye weed	-5		x
<i>Eupatorium purpureum</i>	sweet Joe pye-weed	0	x	
<i>Eupatorium rugosum</i>	white snakeroot	4		
<i>Geum laciniatum</i>	rough avens	-1		
<i>Helianthus grosseserratus</i>	sawtooth sunflower	ni		
<i>Heliopsis helianthoides</i>	Ox-eye sunflower	5	x	

**TABLE 4-3**  
*(Continued)*

Species	Common Name	Coefficient of Wetness	Mesic	Wet
<b>Forbs (1.5 lb/ac uniform mix unless otherwise noted)</b>				
<i>Lespedeza capitata</i>	round-headed bush clover	3	x	
<i>Lobelia cardinalis</i>	cardinal flower	-5		x
<i>Lobelia siphilitica</i>	great blue lobelia	-4		x
<i>Monarda fistulosa</i>	bergamot	3	x	
<i>Penstemon grandiflorus</i>	beardtongue	5	x	
<i>Ratibida pinnata</i>	yellow coneflower	5	x	x
<i>Rudbeckia hirta</i>	black-eyed Susan	3	x	
<i>Smilacina racemosa</i>	false Solomon's seal	4		
<i>Solidago caesia</i>	blue-stemmed goldenrod	3		
<i>Solidago rigida</i>	stiff goldenrod	4	x	
<i>Tradescantia ohioensis</i>	spiderwort	2	x	
<i>Verbena hastata</i>	blue vervain	-4		x
<i>Verbena stricta</i>	hoary vervain	5	x	

Coefficient of Wetness values were obtained from the U.S. Department of Agriculture Plants Database (USDA 2004)

ni = no indicator

Stream bank and side slope stabilization efforts will be integrated with the "Newbury Riffle" grade control structure installed in the vicinity of the Silos area.

#### 4.3.3 Herbaceous Vegetation

As commonly implemented in other wetland projects at the FCP, wetland plant plugs will be installed around created wetland basins. The use of wetland plugs has proven to be very effective in establishing wetland vegetation in restored wetlands. Dormant willow cuttings will also be installed as appropriate to help stabilize spillways. The availability of dormant willow cuttings varies seasonally and may be limited depending on the timing of restoration work in the Silos Area.

Donor vegetation will be imported into the wetland areas from other FCP wetland restoration projects. In addition, the soil and organic matter that accompanies the transplants serves to inoculate created wetlands with desirable mycorrhizae and macroinvertebrates.

#### 4.3.4 Wildlife Amenities

Wildlife amenities will be constructed and installed across the area pursuant to the specifications in Appendix D. Amenities will generally be installed following the completion of planting activities. Field personnel will take care not to compromise wetland basins when installing posts for wood duck boxes. The wildlife amenities for the Silos area include the following:

- Two (2) duck boxes
- Two (2) woodpecker boxes
- Two (2) bat structures
- Two (2) fox dens
- Two (2) hibernaculums

### 4.4 MAINTENANCE ACTIVITIES

Maintenance is critical to restoration success. Activities that will be required include watering, deer control, and invasive species control. These activities are discussed in more detail below.

#### 4.4.1 Watering

Each plant will be watered at the time of installation. Pursuant to the attached specification (Appendix B), field personnel will ensure that each plant receives an adequate amount of water each week, for the first six weeks after planting (or longer if excessive dry or drought conditions exist). Watering will be carried out either directly via hose, tree gator and/or bucket, or remotely via water cannon. Water may be carried out during the second growing season if significant drought conditions



occur similar to the summer of 1999. Under normal rainfall conditions, watering after the initial planting period will not be necessary.

For seeded areas, the timing restrictions in the attached seeding specification (Appendix C) help to ensure that sufficient soil moisture exists for germination and survival of seeds. Weather patterns will be a contributing factor in timing seed application. If seeding activities are required outside of the seeding window, steps will be taken to water seeded areas on a regular basis (i.e., approximately one inch of water per week).

#### 4.4.2 Deer Control

Installed trees and shrubs must be protected from deer browsing and rubbing in order for restoration efforts to be successful. Experience from past restoration projects at the FCP show that enclosure fencing is the most effective means of protection. The Restoration Ecologist will clump shrub plantings in order to maximize the effectiveness of fencing. Field personnel will then install welded wire or deer enclosure fencing around a significant portion, if not all, woody plant material. In some cases, the deer enclosure fencing may be installed around an area prior to planting activities. Where required, individual trees and shrubs will be fenced using the welded wire.



## 5.0 MONITORING

Implementation monitoring parameters for restoration will consist of plant survival and herbaceous cover. Mortality counts will be conducted for all areas at the end of the first growing season (i.e., late summer 2006) to ensure 80% survival is maintained. For Implementation Monitoring of seeded areas herbaceous cover will be evaluated pursuant to the process and criteria set forth in the 2002 Consolidated Monitoring Report (DOE 2003) to ensure 90% vegetative cover is being maintained in seeded areas. Implementation monitoring will be carried out in 2006 by the DOE Office of Legacy Management.

Any functional monitoring of restored wetlands and prairies will be carried out pursuant to the schedule being developed by DOE and the Ohio Environmental Protection Agency as part of the Natural Resource Damages Settlement at Fernald.

## REFERENCES

- Hammer, D., 1996, "Creating Freshwater Wetlands," CRC Press, Boca Raton, Florida.
- Packard, S., and C. Mutel, eds., 1997, "The Tallgrass Restoration Handbook for Prairies, Savannas, and Woodlands," Island Press, Washington, D.C.
- Parsons, 1993, "100 – and 500 – Year Floodplain Determination Sitewide", CERCLA/RCRA Unit 2, Project Order 91, Rev. 0.
- Rosgen, D., 2003, "The Cross-Vane, W-Weir, and J-Hook Vane Structures... Their Description, Design and Application for Stream Stabilization and River Restoration",  
<http://www.wildlandhydrology.com/assets/cross-vane.pdf>.
- U.S. Composting Council, 2004, "Compost Use on State Highway Applications," available online at <http://www.epa.gov/compost/highway/index.htm>.
- U.S. Department of Energy, 2002, "Natural Resource Restoration Plan," Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, Ohio.
- U.S. Department of Energy, 2003, "Consolidated Monitoring Report for Restored Areas at the Fernald Closure Project," Draft, Fernald Closure Project, Cincinnati, Ohio.
- U.S. Department of Energy, 2004, "Area 8, Phase III Natural Resource Restoration Design Plan," Final, Fernald Closure Project, Cincinnati, Ohio.

**APPENDIX A**  
**SILOS AREA PATCH PAGES**



Size:
Flag/tag color

	Planned	Installed
Saplings	349	
Shrubs	192	

Scientific Name	Common Name	Form	Size	Qty.	Installed	Protected	Mulched
<i>Acer rubrum</i>	Red Maple	canopy	4-ft. min.	25			
<i>Acer saccharinum</i>	Silver Maple	canopy	4-ft. min.	3			
<i>Acer saccharum</i>	Sugar Maple	canopy	4-ft. min.	30			
<i>Carya cordiformis</i>	Bitternut Hickory	canopy	4-ft. min.	5			
<i>Carya laciniosa</i>	Shellbark Hickory	canopy	4-ft. min.	16			
<i>Carya ovata</i>	Shagbark Hickory	canopy	4-ft. min.	5			
<i>Celtis occidentalis</i>	Hackberry	canopy	4-ft. min.	2			
<i>Fagus grandifolia</i>	Beech	canopy	4-ft. min.	50			
<i>Fraxinus americana</i>	White Ash	canopy	4-ft. min.	7			
<i>Fraxinus pennsylvanicum</i>	Green Ash	canopy	4-ft. min.	39			
<i>Juglans nigra</i>	Black Walnut	canopy	4-ft. min.	5			
<i>Liriodendron tulipifera</i>	Tulip Poplar	canopy	4-ft. min.	4			
<i>Platanus occidentalis</i>	Sycamore	canopy	4-ft. min.	15			
<i>Populus deltoides</i>	Cottonwood	canopy	4-ft. min.	15			
<i>Prunus serotina</i>	Black Cherry	canopy	4-ft. min.	5			
<i>Quercus alba</i>	White Oak	canopy	4-ft. min.	9			
<i>Quercus bicolor</i>	Swamp White Oak	canopy	4-ft. min.	6			
<i>Quercus inbricaria</i>	Shingle Oak	canopy	4-ft. min.	2			
<i>Quercus palustris</i>	Pin Oak	canopy	4-ft. min.	10			
<i>Quercus prinus</i>	Chestnut Oak	canopy	4-ft. min.	3			
<i>Quercus rubra</i>	Northern Red Oak	canopy	4-ft. min.	12			
<i>Quercus shumardii</i>	Shumard Oak	canopy	4-ft. min.	3			
<i>Quercus velutina</i>	Black Oak	canopy	4-ft. min.	3			
<i>Tilia americana</i>	Basswood	canopy	4-ft. min.	5			
<i>Aesculus glabra</i>	Ohio Buckeye	understory	4-ft. min.	15			
<i>Asimina triloba</i>	Pawpaw	understory	4-ft. min.	7			
<i>Carpinus caroliniana</i>	American Hornbeam	understory	4-ft. min.	2			
<i>Cercis canadensis</i>	Redbud	understory	4-ft. min.	7			
<i>Cornus drummondii</i>	Roughleaf Dogwood	understory	4-ft. min.	4			
<i>Cornus florida</i>	Flowering Dogwood	understory	4-ft. min.	6			
<i>Cornus racemosa</i>	Gray Dogwood	understory	4-ft. min.	24			
<i>Crataegus crus-galli</i>	Cockspur Hawthorne	understory	4-ft. min.	3			
<i>Euonymus atropurpureus</i>	Eastern Wahoo	understory	4-ft. min.	3			
<i>Ostrya virginiana</i>	Hop-Hornbeam	understory	4-ft. min.	2			
<i>Celastrus scandens</i>	Bittersweet	shrub	1-ft. min.	9			
<i>Corylus americana</i>	Hazelnut	shrub	1-ft. min.	9			
<i>Hamamelis virginiana</i>	Witch Hazel	shrub	1-ft. min.	6			
<i>Ilex verticillata</i>	Winterberry	shrub	1-ft. min.	3			
<i>Lindera benzoin</i>	Spicebush	shrub	1-ft. min.	17			
<i>Physocarpus opulifolius</i>	Ninebark	shrub	1-ft. min.	25			
<i>Rhus aromatica</i>	Fragrant Sumac	shrub	1-ft. min.	3			
<i>Rhus glabra</i>	Smooth Sumac	shrub	1-ft. min.	7			
<i>Rosa carolina</i>	Carolina Rose	shrub	1-ft. min.	7			
<i>Salix humila</i>	Prairie Willow	shrub	1-ft. min.	14			
<i>Sambucus canadensis</i>	Elderberry	shrub	1-ft. min.	10			
<i>Staphylea trifolia</i>	Bladdernut	shrub	1-ft. min.	30			
<i>Symphoricarpos orbiculatus</i>	Coralberry	shrub	1-ft. min.	10			
<i>Viburnum acerifolium</i>	Mapleleaf Viburnum	shrub	1-ft. min.	9			
<i>Zanthoxylum americanum</i>	Prickly Ash	shrub	1-ft. min.	30			

## Notes



Size:
Flag/tag color

	Planned	Installed
Saplings	291	
Shrubs	130	

Scientific Name	Common Name	Form	Size	Qty.	Installed	Protected	Mulched
<i>Acer nigrum</i>	Black Maple	canopy	4-ft. min.	10			
<i>Acer rubrum</i>	Red Maple	canopy	4-ft. min.	25			
<i>Acer saccharum</i>	Sugar Maple	canopy	4-ft. min.	30			
<i>Carya laciniosa</i>	Shellbark Hickory	canopy	4-ft. min.	15			
<i>Carya ovata</i>	Shagbark Hickory	canopy	4-ft. min.	5			
<i>Fagus grandifolia</i>	Beech	canopy	4-ft. min.	50			
<i>Fraxinus pennsylvanicum</i>	Green Ash	canopy	4-ft. min.	30			
<i>Juglans nigra</i>	Black Walnut	canopy	4-ft. min.	7			
<i>Liriodendron tulipifera</i>	Tulip Poplar	canopy	4-ft. min.	4			
<i>Platanus occidentalis</i>	Sycamore	canopy	4-ft. min.	8			
<i>Populus deltoides</i>	Cottonwood	canopy	4-ft. min.	15			
<i>Quercus alba</i>	White Oak	canopy	4-ft. min.	9			
<i>Quercus palustris</i>	Pin Oak	canopy	4-ft. min.	5			
<i>Quercus rubra</i>	Northern Red Oak	canopy	4-ft. min.	5			
<i>Quercus shumardii</i>	Shumard Oak	canopy	4-ft. min.	4			
<i>Tilia americana</i>	Basswood	canopy	4-ft. min.	3			
<i>Aesculus glabra</i>	Ohio Buckeye	understory	4-ft. min.	21			
<i>Asimina triloba</i>	Pawpaw	understory	4-ft. min.	7			
<i>Cercis canadensis</i>	Redbud	understory	4-ft. min.	6			
<i>Cornus drummondii</i>	Roughleaf Dogwood	understory	4-ft. min.	3			
<i>Cornus florida</i>	Flowering Dogwood	understory	4-ft. min.	6			
<i>Cornus racemosa</i>	Gray Dogwood	understory	4-ft. min.	20			
<i>Crataegus crus-galli</i>	Cockspur Hawthorne	understory	4-ft. min.	3			
<i>Euonymus atropurpureus</i>	Eastern Wahoo	understory	4-ft. min.	3			
<i>Celastrus scandens</i>	Bittersweet	shrub	1-ft. min.	9			
<i>Hamamelis virginiana</i>	Witch Hazel	shrub	1-ft. min.	6			
<i>Lindera benzoin</i>	Spicebush	shrub	1-ft. min.	10			
<i>Physocarpus opulifolius</i>	Ninebark	shrub	1-ft. min.	25			
<i>Rosa carolina</i>	Carolina Rose	shrub	1-ft. min.	7			
<i>Staphylea trifolia</i>	Bladdernut	shrub	1-ft. min.	30			
<i>Symphoricarpos orbiculatus</i>	Coralberry	shrub	1-ft. min.	5			
<i>Viburnum acerifolium</i>	Mapleleaf Viburnum	shrub	1-ft. min.	5			
<i>Zanthoxylum americanum</i>	Prickly Ash	shrub	1-ft. min.	30			

## Notes



Size:
Flag/tag color

	Planned	Installed
Saplings	185	
Shrubs	128	

Scientific Name	Common Name	Form	Size	Qty.	Installed	Protected	Mulched
<i>Acer nigrum</i>	Black Maple	canopy	4-ft. min.	13			
<i>Acer rubrum</i>	Red Maple	canopy	4-ft. min.	14			
<i>Acer saccharinum</i>	Silver Maple	canopy	4-ft. min.	3			
<i>Acer saccharum</i>	Sugar Maple	canopy	4-ft. min.	10			
<i>Carya cordiformis</i>	Bitternut Hickory	canopy	4-ft. min.	4			
<i>Carya ovata</i>	Shagbark Hickory	canopy	4-ft. min.	12			
<i>Fagus grandifolia</i>	Beech	canopy	4-ft. min.	10			
<i>Fraxinus americana</i>	White Ash	canopy	4-ft. min.	14			
<i>Fraxinus pennsylvanicum</i>	Green Ash	canopy	4-ft. min.	20			
<i>Juglans nigra</i>	Black Walnut	canopy	4-ft. min.	5			
<i>Liriodendron tulipifera</i>	Tulip Poplar	canopy	4-ft. min.	5			
<i>Platanus occidentalis</i>	Sycamore	canopy	4-ft. min.	15			
<i>Populus deltoides</i>	Cottonwood	canopy	4-ft. min.	16			
<i>Prunus serotina</i>	Black Cherry	canopy	4-ft. min.	6			
<i>Quercus bicolor</i>	Swamp White Oak	canopy	4-ft. min.	6			
<i>Quercus palustris</i>	Pin Oak	canopy	4-ft. min.	16			
<i>Quercus shumardii</i>	Shumard Oak	canopy	4-ft. min.	3			
<i>Aesculus glabra</i>	Ohio Buckeye	understory	4-ft. min.	5			
<i>Cornus drummondii</i>	Roughleaf Dogwood	understory	4-ft. min.	3			
<i>Cornus racemosa</i>	Gray Dogwood	understory	4-ft. min.	5			
<i>Ilex verticillata</i>	Winterberry	shrub	1-ft. min.	4			
<i>Physocarpus opulifolius</i>	Ninebark	shrub	1-ft. min.	24			
<i>Rhus aromatica</i>	Fragrant Sumac	shrub	1-ft. min.	13			
<i>Rhus glabra</i>	Smooth Sumac	shrub	1-ft. min.	10			
<i>Rosa carolina</i>	Carolina Rose	shrub	1-ft. min.	7			
<i>Salix humila</i>	Prairie Willow	shrub	1-ft. min.	7			
<i>Sambucus canadensis</i>	Elderberry	shrub	1-ft. min.	7			
<i>Staphylea trifolia</i>	Bladdernut	shrub	1-ft. min.	19			
<i>Symphoricarpos orbiculatus</i>	Coralberry	shrub	1-ft. min.	5			
<i>Viburnum acerifolium</i>	Mapleleaf Viburnum	shrub	1-ft. min.	5			
<i>Zanthoxylum americanum</i>	Prickly Ash	shrub	1-ft. min.	27			

**APPENDIX B**  
**PLANTING SPECIFICATIONS**

**SECTION 02940  
PLANTING**

**PART 1 GENERAL**

**1.1 SCOPE**

- A. This Section includes the requirements for planting trees, shrubs, and herbaceous potted plants as shown on the Construction Drawings.

**1.2 RELATED SECTIONS AND DOCUMENTS**

- A. Section 02930 - Vegetation.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- A. Container grown trees shall be a minimum of 6 feet in height, grown in "spin-out" containers and acquired from a local seed source if possible. Potting material shall be pre-inoculated with mycorrhizae.
- B. Container-grown shrubs shall be a minimum of 1 foot in height, grown in "spin-out" containers and acquired from a local seed source if possible. Potting material shall be pre-inoculated with mycorrhizae.
- C. Bareroot seedlings shall be pre-inoculated with ecto-mycorrhizae and shall not be exposed to the air any longer than possible prior to planting.
- D. Herbaceous potted plants shall be grown in open bottom, minimum 2-inch square and 3-inch deep containers. Potting material shall be inoculated with ecto-mycorrhizae.
- E. Fertilizer shall be slow-release tablet form, and not exceed a N-P-K mix of 22-5-10. Fertilizer shall contain not less than 1 percent added sulfur and not more than 8 percent added iron, or an approved equal.
- F. Mulch shall be an aged hardwood mulch, free of clay, stone, foreign substances, and free of weeds.
- G. Wooden stakes for staking trees as needed shall be nominal 2 inch square, approximately 18-inches in length.

**2.2 EQUIPMENT**

- A. Equipment for performing work in this section shall be low ground pressure equipment that will not compact amended soils.



## **PART 3      EXECUTION**

### **3.1 GENERAL**

- A.     Planting locations will be flagged in the field by the Restoration Ecologist. The Restoration Ecologist is the Fluor Fernald contact responsible for identifying locations of all plant material installation, verifying acceptance of delivered plant material, and ensuring proper installation.
- B.     Unless otherwise approved by the Restoration Ecologist, all plant installation shall take place between October 1 and December 15 or February 15 and May 15.
- C.     The Restoration Ecologist may restrict planting activities based on field conditions (e.g., droughts, unseasonable freezes).
- D.     No plant installation may take place while the soil surface is frozen.
- E.     Plant material delivered to the project site that will not be planted within 24 hours shall have their containers completely covered with woodchip mulch and kept moist with periodic watering.
- F.     The Construction Manager will provide a source of water sufficient to support all field activities specified in this Section.

### **3.2 INSTALLATION OF CONTAINER-GROWN TREES AND SHRUBS (DETAIL A-1)**

- A.     Excavate planting pit to a depth such that the top of the ball, when planted, extends 1 to 2 inches above ground surface.
- B.     Excavate the planting pit so that it is wider than the root ball by 9 inches on all sides.
- C.     Scarify the sides of the planting pit using a shovel.
- D.     Remove the plant from the container by carefully inverting the plant and loosening the root ball from the container, cutting the container if necessary. Keep the root ball as intact as possible. Handle the plant by the root ball only. Do not pull the plant from the container by the trunk of the tree or shrub.
- E.     Add a slow-release fertilizer tablet or packet (e.g., Osmocote, Agriform or similar) around the ball per manufacturers recommendations.
- F.     Set trees and shrubs such that the top of the ball extends 1 to 2 inches above the ground surface and that the trunk is vertical. Trunks shall have no appreciable lean, at the discretion of the Restoration Ecologist.
- G.     Backfill around the root ball with a mixture of the topsoil and subsoil removed from the pit. Gently tamp the backfill as it is placed into the pit.

- H. Water the tree/shrub immediately after planting to saturate the upper 12 inches of soil.
- I. Remove any tags, labels, strings or wires from the plant, unless otherwise directed by the Restoration Ecologist.

### **3.3 INSTALLATION OF BAREROOT PLANTS (DETAIL A-2)**

- A. Carry bareroot plants in a bucket of water (or moist sand or other moist medium) in the field to keep the roots from drying out. Bareroot plants shall not be stored in water for more than 6 hours at a time. Bareroot plants that require overnight storage shall have their root balls covered completely with moist hardwood mulch and kept moist with periodic watering.
- B. Excavate the planting pit by hand using a dibble bar or spade. The pit shall be only broad enough to accommodate the roots when fully extended and only deep enough such that the uppermost roots will be just below ground surface.
- C. Set the plant and spread the roots in a natural pattern such that the roots are fully extended without touching the sides of the planting pit and that the uppermost roots are just below ground surface.
- D. Carefully work backfill (mix of topsoil and subsoil removed from the planting pit) through the fully spread root systems and water while backfilling.
- E. Firmly tamp backfill with the heel of the shoe when complete.
- F. Remove any tags, labels, and strings from the plant, unless otherwise directed by the Restoration Ecologist.

### **3.4 INSTALLATION OF HERBACEOUS POTTED PLANTS**

- A. Place potted plant flats in standing water immediately upon delivery to the project site. Keep flats in water until installation.
- B. Excavate the planting pit by hand using a dibble bar or spade. The pit shall be only broad enough to accommodate the roots when fully extended and only deep enough such that the uppermost roots will be just below ground surface.
- C. Set the plant and spread the roots in a natural pattern such that the roots are fully extended without touching the sides of the planting pit and that the uppermost roots are just below ground surface.
- D. Carefully work backfill (mix of topsoil and subsoil removed from the planting pit) through the fully spread root systems and water while backfilling.
- E. Firmly tamp backfill with the heel of the shoe when complete.
- F. Remove any tags, labels, and strings from the plant, unless otherwise directed by the Restoration Ecologist.

### **3.5 PRUNING**

- A. Once trees and shrubs are planted, prune off any dead or damaged limbs.
- B. All pruning shall involve removal of limbs back to a lateral branch or bud.
- C. Perform additional pruning at the request of the Restoration Ecologist.

### **3.6 MULCHING**

- A. Apply a 4-inch layer of hardwood mulch over a circular area 4 feet in diameter surrounding balled and burlapped and container grown trees and shrubs. At the discretion of the Restoration Ecologist, straw may be used as a substitute for hardwood mulch.
- B. Apply a 4-inch layer of hardwood mulch over a circular area 2 feet in diameter surrounding each bare root or potted plant. At the discretion of the Restoration Ecologist, straw may be used as a substitute for hardwood mulch.
- C. Mulch shall be placed so as to not physically contact the plants.

### **3.7 WATERING**

- A. Water all planted material weekly for 6 weeks following installation, unless otherwise directed by the Restoration Ecologist. Watering shall be sufficient to saturate the entire root ball. This typically requires the slow release of approximately 10 gallons of water for each plant.

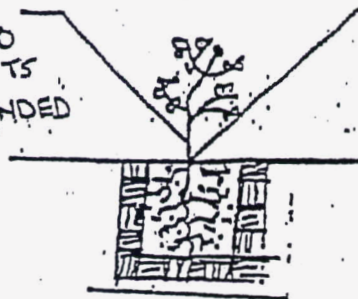
### **3.8 STAKING AND GUYING**

- A. Stake and guy trees only at the request of the Restoration Ecologist.



Detail A-2: Installation of Bareroot Plants

PLANTING POT  
LARGE ENOUGH TO  
ACCOMMODATE ROOTS  
IN A FULLY EXTENDED  
POSITION



SET PLANT SUCH  
THAT UPPER MOST  
ROOTS ARE JUST  
BELOW THE SOIL  
SURFACE

**APPENDIX C**  
**SEEDING SPECIFICATIONS**

**SECTION 02930  
SEEDING AND BIOENGINEERING EROSION CONTROL**

**PART 1 GENERAL**

**1.1 SCOPE**

- A. This Section includes soil stabilization, which includes application of crusting agent, establishing vegetation by seeding and dormant live cuttings, and installing biodegradable erosion control materials. The work in this Section includes, but is not limited to; soil preparation, interim vegetation, permanent vegetation, application of fertilizer, application of mulches, application of crusting agent, and installation of erosion control materials.

**1.2 RELATED SECTIONS AND PLANS**

Section 02940 – Planting

**1.3 REFERENCES**

- A. Latest version of Ohio Department of Natural Resources (ODNR) Rainwater and Land Development Standards (ODNR Rainwater and Land Development Standards).
- B. *"Identification and Listing of Hazardous Waste,"* Title 40, Code of Federal Regulations (CFR), Part 261, Subpart E.C.
- C. *"Federal Hazardous Material Transportation Law,"* U.S. Department of Transportation (U.S. DOT, 1994).

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- A. Furnish seed labeled in accordance with U.S. Department of Agriculture (USDA) Rules and Regulations under the Federal Seed Act and applicable State seed laws. Furnish seed in sealed bags or containers bearing the date of expiration. Do not use seed after its date of expiration. Each variety of seed shall have a purity of not less than 90 percent by weight, a percentage of germination not less than 80 percent by weight, and a weed to seed content of not more than 0.75 percent by weight and contain no noxious weeds. Furnish seed mixtures having seed proportioned by weight in accordance with Table 02930-1A, Table 02930-1B, and Table 02930-2 of this Section. Areas requiring permanent seeding during the summer months (July 1 – September 20) shall be seeded with 30 lbs/acre of ReGreen or stabilize with a crusting agent as specified in this Section, unless otherwise directed by the Construction Manager or the Restoration Ecologist. Stabilization performed during the summer shall be followed by fall application of the appropriate permanent seed mix.



- B. Permanent seed mixes shall be treated with fungal (mycorrhizae) inoculant and bacterial (rhizobium) inoculants. The specified legumes must be inoculated with the appropriate rhizobial strains.

Furnish mulch meeting the following requirements:

1. Mulch shall be straw or wood cellulose fibers; free of clay, stone, foreign substances, and free of weeds.
2. Straw should not contain sticks larger than ¼-inch diameter or other materials that may prevent matting down during application. Use straw that is free from mold and other objectionable material for placing with mulch blower equipment or other equipment as approved by the Construction Manager. Straw shall be generally 6 inches or more in length.
3. Straw shall be:
  - a. weed free straw from the Minnesota Crop Improvement Association certified weed free straw vendors;
  - b. straw that has been inspected and determined to be weed free by Central Ohio Seed Testing;
  - c. native prairie grass mulch; or
  - d. equivalent substitute as approved by the Construction Manager.
4. Mulch applied by hydrospraying shall be a bonded fiber matrix containing wood fibers held together with a hydrocolloid-based binder, which upon drying becomes insoluble and non-dispersible. The fibers shall be composed of 100 percent wood or wood by-products and shall be 100 percent biodegradable. Use a bonded fiber matrix containing a green dye that will provide for easy visual inspection for uniformity of slurry spread. The bonded fiber matrix, including dye, shall contain no growth or germination inhibiting properties. The wood cellulose fiber shall be manufactured in such a manner that, after addition and agitation in slurry tanks with water, the fibers in the material become uniformly suspended to form a homogeneous material. When sprayed on the ground, the material shall allow absorption and percolation of moisture. The wood cellulose fiber shall meet the following requirements:

<u>Item</u>	<u>Specification Limit</u>
Particle Length	0.4 inch (maximum)
Particle Thickness	0.047 inch (maximum)
PH	4.0 to 8.5
Ash Content	1.6 % (maximum)
Water Holding Capacity (based on fiber dry weight)	500 % (minimum)
Moisture Content	12 % ± 3 % (by weight)

- D. Mulch binder agent shall be as approved by the Construction Manager and shall meet the following requirements:
1. The mulch binder shall be hydrocolloid base (guar gum) and shall not dissolve or disperse upon rewetting.
  2. The mulch binder shall not have hazardous characteristics of ignitability, corrosivity, reactivity, or toxicity as defined in 40 CFR Part 261. Subpart C, for a hazardous waste in either its pre-applied or cured states.
  3. The mulch binder shall have a flash point greater than 200°F. The mulch binder shall be neither a flammable nor combustible liquid per U.S. Department of Transportation definition (DOT 1994). The mulch binder must not be susceptible to significant deterioration from exposure to the elements, including sunlight.
  4. The mulch binder shall be provided in concentrated solution and prepared so that it will not change in transportation or storage.
- E. The crusting agent shall be as approved by the Construction Manager and shall meet the following criteria:
1. pine sap emulsion comprised of a 100 percent organic emulsion produced from naturally occurring resins (pine sap); or a mixture of Conwed Fiber's Enviroblend hydraulic mulch and Finn Corporation's A-500 Hydro-Stik tacking agent (mulch binder); or an approved equal;
  2. not comprised of chloride, lignosulfonate, petroleum, or asphaltic-type emulsions;
  3. provide dust suppression and surface stability for exposed soils, both disturbed and undisturbed soils, and exposed coal fired ash (flyash);
  4. compatible with application via a hydro seeder, and must not require intense cleaning of equipment after application;
  5. non-tracking (i.e., will not stick to boots or tires) once cured;
  6. not have hazardous characteristics of ignitability, corrosivity, reactivity, or toxicity as defined in 40 CFR Part 261, Subpart C, for a hazardous waste in either its pre-applied or cured states;
  7. have a flash point greater than 200°F;
  8. be neither a flammable nor combustible liquid per DOT definition; and
  9. not be susceptible to significant deterioration from exposure to the elements, including sunlight.

Woven coir erosion mat shall meet the following criteria:

coconut fiber content: 100%

weight: 22 ounces per square yard

thickness: 0.3 inches

open area: 38%

tensile strength: 1,350 lb/ft by 626 lb/ft (length by width)

elongation: 34% by 38% (length by width)

- F. Coconut logs shall be constructed of 100% coconut fiber, 10-inch minimum diameter and 8-foot maximum length.
- G. Wood stakes for fastening coir mats and logs shall be as follows:
  - 1. stakes for coir erosion mats shall be nominal 2-inch square, minimum 8 inches in length.
  - 2. stakes for coconut logs shall be nominal 2-inch square, minimum 35 inches in length.
- I. Metal staples for fastening coir mats shall be 11-gauge wires formed into a staple shape with minimum dimensions of 6 inches by 1 inch by 6 inches.
- J. Dormant live cuttings for bioengineering erosion control shall be as follows:
  - 1. length: 2.5-foot minimum, 4 foot maximum
  - 2. diameter: 0.5-inch minimum, 2 inch maximum
  - 3. acceptable species include: silky dogwood (*Cornus amomum*), gray dogwood (*Cornus racemosa*), red osier dogwood (*Cornus stolonifera*), cottonwood (*Populus deltoides*), peachleaf willow (*Salix amygdaloides*), pussy willow (*Salix discolor*), sandbar willow (*Salix exigua*), black willow (*Salix nigra*), silky willow (*Salix sericea*), elderberry (*Sambucus canadensis*), and arrow wood (*Viburnum dentatum*). Additional species may be used upon approval by the Restoration Ecologist.
- K. Fertilizer:
  - 1. Furnish commercial grade fertilizer, uniform in composition that meets the requirements of all State and Federal regulations and standards of the Association of Agricultural Chemists.
  - 2. Fertilizer shall be slow release complete fertilizer.



3. Fertilizer for application within the area shall be 34-0-10; other fertilizers may be approved by the Construction Manager or Restoration Ecologist. Fertilizers shall contain not less than 1 percent added sulfur and not more than 8 percent added iron, or an approved equal.
4. Fertilizer must have MSDS submitted in accordance with this Section.
5. Fertilizer shall be used for interim seeding only.
6. Construction water shall be obtained from the on-site water source as directed by the Construction Manager.

## 2.2 EQUIPMENT

- A. Provide equipment of size and type to perform work specified in this Section.

## PART 3 EXECUTION

### 3.1 DELIVERY, STORAGE, AND HANDLING

- A. Deliver containerized materials in uniform packages bearing the name of the manufacturer, the net weight and a statement of content. Deliver containerized materials to the site in original, properly labeled, unopened, clean containers each showing the manufacturer's guaranteed analysis conforming to applicable regulations and standards.
- B. Store materials in a dry area in a manner to prevent physical damage.

### 3.2 GENERAL

- A. Stabilization of disturbed areas by vegetation or by use of a crusting agent shall be performed at completion of excavation and stockpiles or within 7 calendar days of knowing a disturbed area will be idle for more than 45 calendar days, whichever is sooner.
- B. Crusting agents may be used as temporary measures prior to placement of interim vegetation after approval for the area by the Construction Manager.
- C. Disturbed areas which are scheduled to be significantly disturbed after initial stabilization and/or need effective erosion control immediately, are to be stabilized with the interim seed mix rate specified in this Section. Disturbed areas, which are not scheduled to be significantly disturbed again, are to be stabilized with the permanent seed mix rate specified in this Section. Soil piles, which require effective erosion control immediately, are to be stabilized with the interim seed mix rate or a crusting agent as specified in this Section.
- D. Stabilization of permanent slopes steeper than 3H:1V (horizontal to vertical) shall utilize coir matting as specified in Section 3.5 of this specification after application of seed mixture, unless otherwise specified by the Construction Manager or Restoration Ecologist.

- E. Area(s) to be seeded shall be generally free of debris, rock, root material, and other objects that may impede soil preparation and seeding activities. Perform soil preparation by tilling/cultivating, to a depth of approximately 2 inches, to eliminate uneven areas and low spots. Maintain lines, levels and contours.
- F. Repeat cultivation in areas where equipment used for hauling and spreading has compacted the area(s) to be seeded.

### 3.3 APPLICATION OF SEED AND CRUSTING AGENT

- A. The seeding season, for interim vegetation specified in this Section, is year round. However, if seeding is contemplated during the winter months of December through March, then field conditions should be assessed for ability to provide soil to seed contact. If field conditions do not support the ability to provide soil to seed contact then the area shall be stabilized with a crusting agent followed by seeding during conditions conducive to adequate soil to seed contact.
- B. The seeding seasons for permanent seeding in wet and dry areas are Spring Season between April 1 and July 1 and Fall Season between October 1 and November 15.
- C. Apply fertilizer, seed, and mulch to disturbed areas and areas excavated and graded under this Contract requiring seeding unless otherwise directed by the Construction Manager. Apply mulch within 24 hours of seeding; do not seed areas in excess of that which can be mulched within 24 hours. Winter application of seed and related materials are subject to adjustment as directed by the Construction Manager.
- D. Apply seed using either the drilling, broadcasting, or hydroseeding method, as described below:
  - 1. Seed drilling method:
    - a. This method shall be used for applying the permanent seed mix in accessible areas unless otherwise approved by the Construction Manager. The method may also be used for interim vegetation.
    - b. Prepare area to be seeded by loosening the soil to a minimum depth of 3 inches.
    - c. Apply commercial grade, slow release complete fertilizer, for interim vegetation only, at a rate of 150 lbs/acre at the time of preparing the seedbed for seeding.
    - d. Install seed with a seed drill to obtain a final planting depth of  $\frac{1}{4}$  to  $\frac{1}{2}$  inch using the seed rates indicated in Table 02930-1A, Table 02930-1B, and Table 02930-2 of this Section. All seed drilling should be done perpendicular to the direction of surface-water flow.



2. Broadcast Seeding Method:

- a. This method may be used for interim vegetation, and can be performed with the use of mechanical "cyclone" seeders, by hand seeding or by any other method which scatters seed over the soil surface.
- b. This method may also be used for permanent seeding in areas that are not accessible with the seed drill (i.e., sloped areas) as approved by the Construction Manager.
- c. If Broadcast Method is used to apply permanent seed mix in sloped areas (3H:1V slope or steeper), seeding application rates in Table 02930-1A, Table 02930-1B, and Table 02930-2 of this Section shall be doubled.
- d. Prepare the area to be seeded by loosening the soil to a minimum depth of 3 inches. This is critical to allow seeds to filter into the soil to avoid washout from runoff.
- e. Apply commercial grade, slow release complete fertilizer, for interim vegetation only, at a rate of 150 lbs/acre at the time of preparing the seedbed for seeding.
- f. Install seed by broadcasting evenly over the entire site using the seed rates indicated in Table 02930-1A, Table 02930-1B, and Table 02930-2 of this Section.
- g. Rake the area after seeding.
- h. Mulch and disc-anchor using weed free mulch at a rate of 2.0 tons per acre. Spread straw mulch, either by hand or by blowing method, at the rate of 2 air-dried tons per acre. During June through September, increase straw mulch application rate to 3 air-dried tons per acre.

3. Hydroseeding Method:

- a. This method may be used for interim vegetation only. Hydroseeding shall be a two-step process. The seed shall be applied first, followed by a separate application of the mulch. This is to ensure soil to seed contact.
- b. The mixture tank shall be cleaned prior to use to ensure remnant seed is not introduced to the proposed seed mixture.
- c. Prepare area to be seeded by loosening the soil to a minimum depth of 3 inches. This is critical to allow seeds to filter into the soil to avoid washout from runoff.
- d. Apply commercial grade, slow release complete fertilizer, for interim vegetation only, at a rate of 150 lbs/acre. The fertilizer is to be mixed and applied with the mulch.



- e. Install seed by hydroseeding evenly over the entire area using the seed rates indicated in Table 02930-2. Use a fan-type nozzle with approximately 500 gallons of water per acre to ensure even distribution.
- f. Rake the area where accessible following seeding.
- g. Apply sprayed mulch at a net dry weight of 2,000 pounds per acre minimum and 100 percent continuous coverage. Mix the mulch with water at a ratio of 50 pounds of mulch per 100 gallons of water.

E. Application of Crusting Agent:

- 1. Apply crusting agent in accordance with manufacturer's directions.
- 2. Unless otherwise specified by the manufacturer, dilute concentrated pinesap emulsion to ratio of 4 parts water to 1 part concentrate. Apply diluted pinesap emulsion at a rate of 2,500 gallons per acre.
- 3. Apply a mixture of Conwed Fiber's Enviroblend hydraulic mulch and Finn Corporation's A-500 Hydro-Stik mulch binder, using the hydroseeder, at the rate of 1,000 lbs/acre on flat surfaces; and 1,125 lbs/acre on slopes greater than 3H:1V. The mixture rate for each product shall be 20 lbs/acre on flat surfaces and 30 lbs/acre on greater than 3H:1V slopes for the hydraulic mulch; and 20 lbs/acre on flat surfaces and 30 lbs/acre on slopes greater than 3H:1V for the Hydro-Stik mulch binder.

### 3.4 BIOENGINEERING EROSION CONTROL

- A. Following seeding, install coir matting and/or coir logs in areas indicated on the Construction Drawings, on slopes steeper than 3H:1V, or in any other areas prone to erosions, identified by the Construction Manager or the Restoration Ecologist. Installation is as follows:
  - 1. coir matting: Stake coir matting on minimum 5-foot centers with wood stakes, angled upstream/upgradient. Use metal staples for added support, installing staples on minimum 5-foot centers between wood stakes and in additional areas so that the coir matting is in direct contact with the soil. The Restoration Ecologist shall direct the installation of additional stakes and/or staples as necessary. Overlap adjoining sections of coir matting 6 to 12 inches, with the upstream/upgradient matting laid on top. Sew adjoining sections of matting together with coir rope. Bury the upper edge of coir matting in a 6-inch trench.
  - 2. coir logs: Stake coir logs on 10-foot centers. Install 2 stakes opposite each other and tie the stakes together with coir rope. Sew adjoining coir logs together with coir rope.
- B. Secure all coir materials at the end of the day in preparation for unexpected rain events.

- C. Dormant live cuttings shall be installed as follows: Cut a point onto the bottom of the live cutting and drive into the soil on 4 foot centers using a dead blow hammer. Drive cuttings (minimum two-thirds, maximum four-fifths of their length) into soil angled slightly downstream/downgradient. Minimize damage to the cuttings when driving into the soil. If necessary, prepare a pilot hole by driving rebar into the soil and removing prior to inserting cuttings. Saw any damaged tops once the cuttings are installed. Dormant live cuttings may be installed into coir matting or other areas prone to erosion as directed by the Restoration Ecologist.

### 3.5 MAINTENANCE

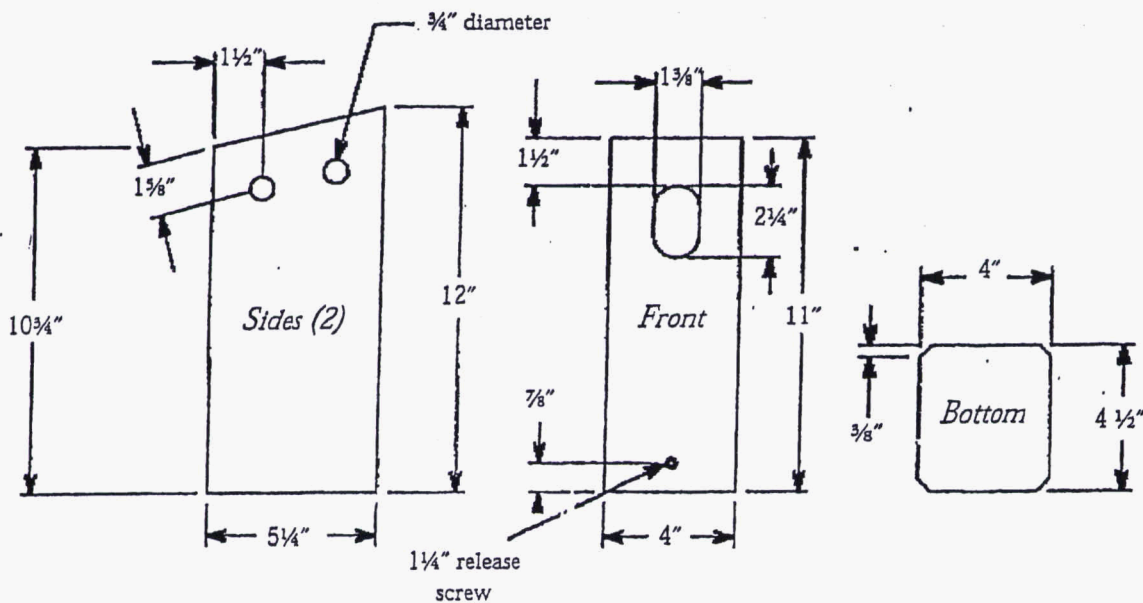
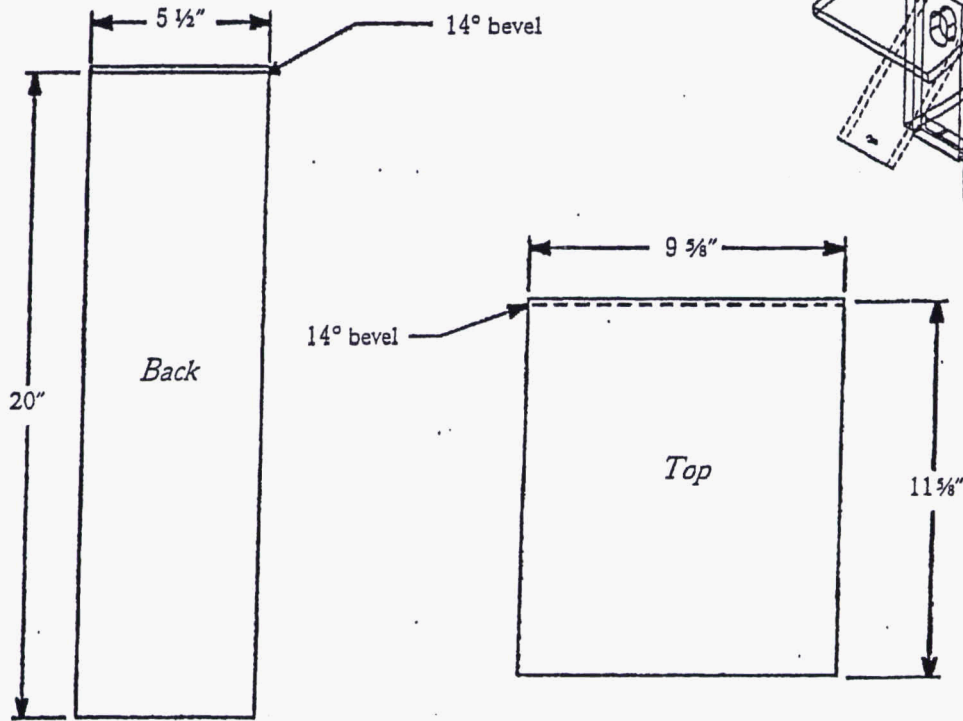
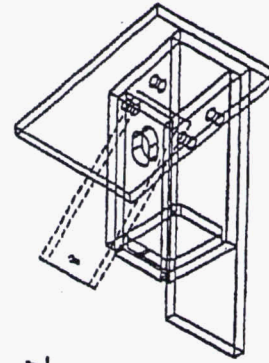
- A. Maintain the vegetated areas in satisfactory condition until acceptance of the vegetation by the Construction Manager. Maintenance of the vegetated areas includes repairing eroded areas, revegetating when necessary, watering, and mowing (if applicable). A satisfactory condition of vegetated area is defined as follows:
1. an area shall have a predominant stand of the seeded vegetation;
  2. within 3 weeks, germination must occur over 90 percent of the area with no single bare area greater than 3 square feet; and
  3. within 3 months, 90 percent of the area must be covered with mature vegetation.
- B. The above timeframes for germination and coverage requirements are to be delayed during the dormant season between November 1 and March 15 application of the seed. The performance criteria shall be measured at the beginning of the growing season (April 1) for seed applied during the previous dormant season.
- C. Areas that fail to meet these requirements shall be repaired or reseeded as necessary to produce an acceptable stand of vegetation, as specified in this Section.
- D. The acceptance inspection will be performed by the Construction Manager who will determine whether repair of vegetated areas or revegetation is required.
- E. Maintain areas with a crusting agent to ensure proper erosion control. The crusting agent shall be reapplied to eroded and bare areas as necessary.

**APPENDIX D**  
**WILDLIFE AMENITY SPECIFICATIONS**



# A Nest-Box Plan for Cavity-Nesting Songbirds

(flycatchers, swallows, titmice, chickadees, nuthatches, wrens, and bluebirds)



All wood in the design is 3/4" actual thickness. The pictured entrance hole is recommended for bluebirds. To adapt the nest box for individual species, change the dimensions of the entrance hole. Visit <http://birds.cornell.edu/birdhouse> for guidelines on entrance hole sizes.

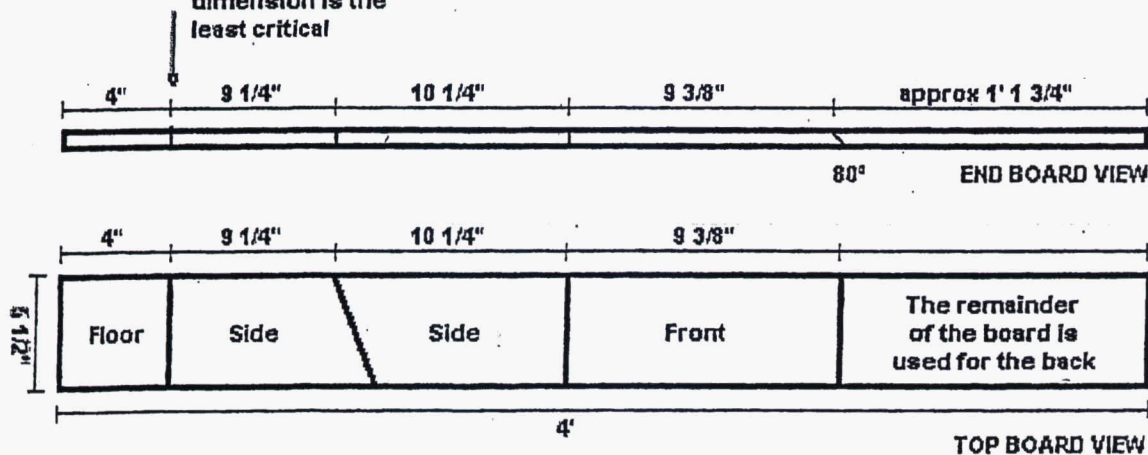
# Eastern/Western Bluebird Nest Box Plans -- Part 1

## MATERIALS LIST

- Standard Board 1" x 6" x 4' long
- Standard Board 1" x 10" x 10 1/2" long (for roof)
- 1 3/4" galvanized nails or screws -- approx. 20
- 1 3/4" galvanized screw or nail for pivot point -- 2
- Double-headed Nail for holding door closed -- 1

## BOARD DIAGRAM

Start cutting at  
the "Floor" and work  
towards the "back"  
since the "back"  
dimension is the  
least critical

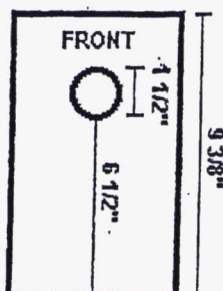
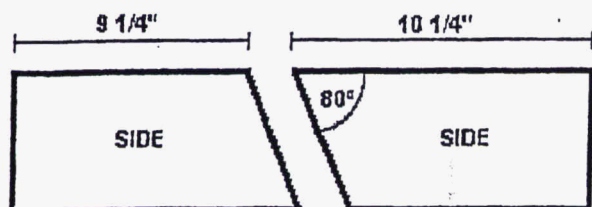


[Back](#) | [Go to Construction Plans](#)

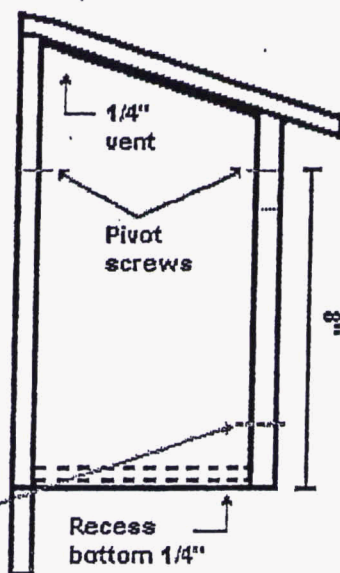
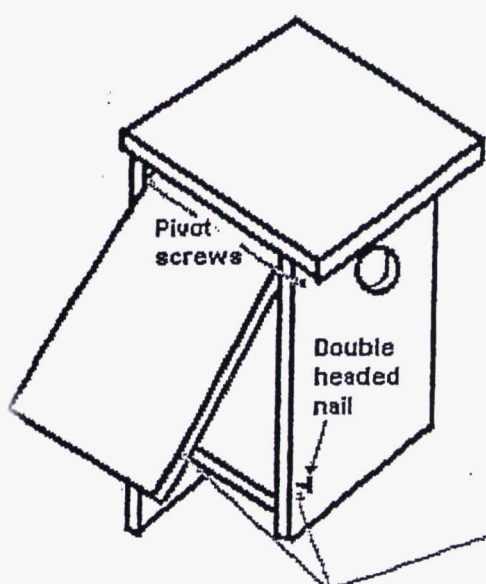
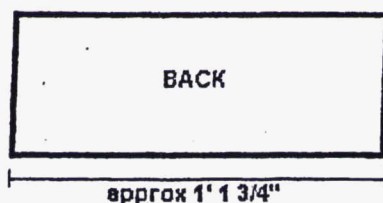
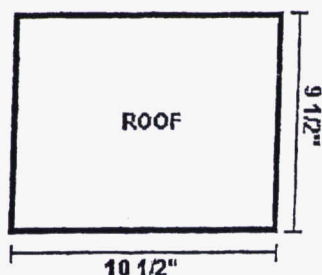
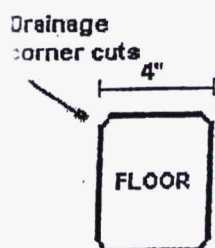
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North American Bluebird Society  
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## Eastern/Western Bluebird Nest Box Plans -- part 2

### CONSTRUCTION PLAN



Special note: A 1 9/16" hole should be used where the ranges for Eastern or Western Bluebirds overlap with Mountain Bluebirds.



Drill hole through "front" and side of door to hold door closed with nail

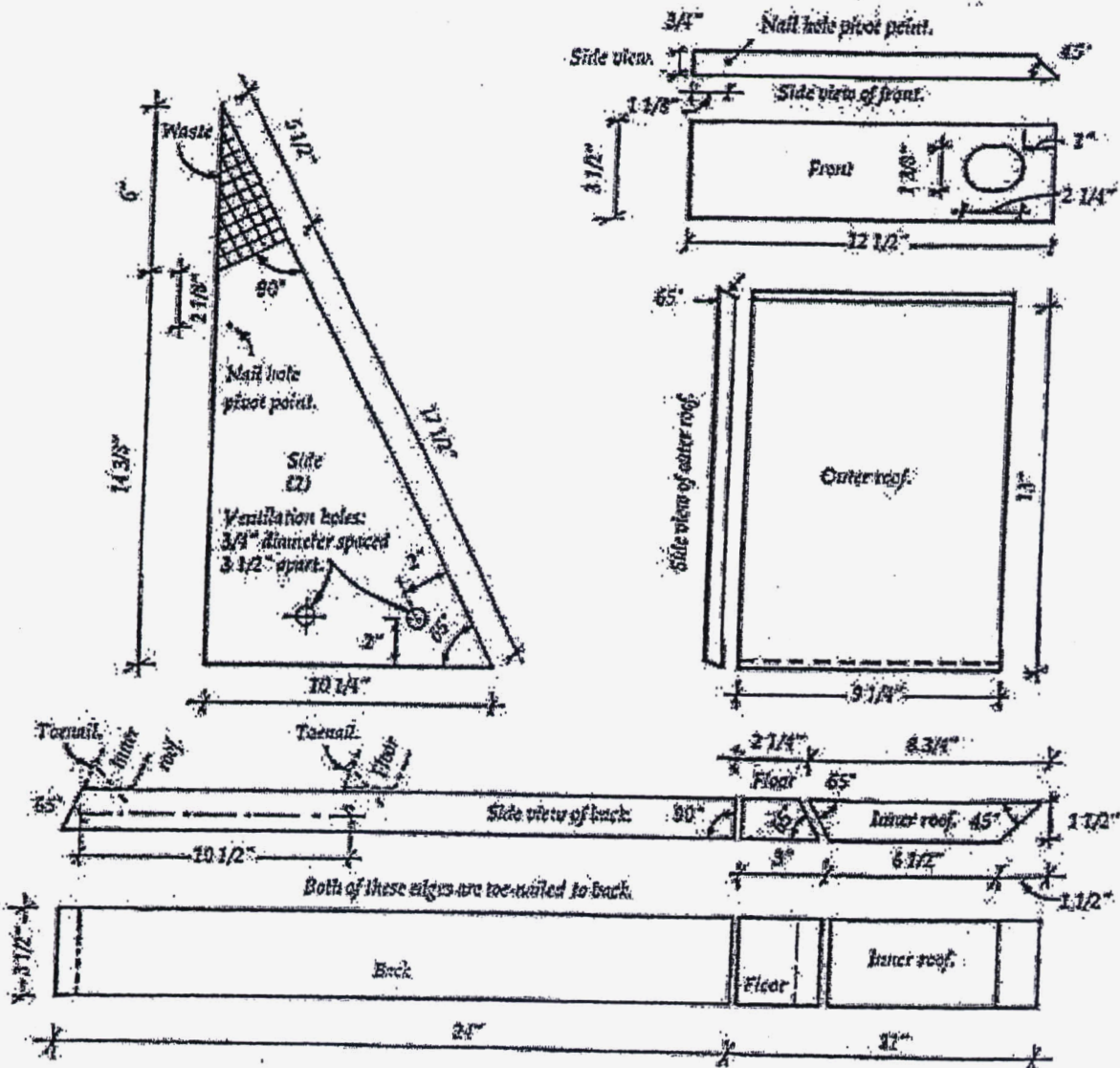
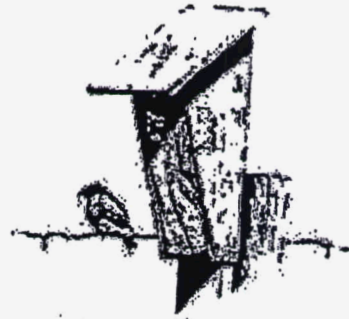
Go to Plans for Optional Oval Hole



# PETERSON BLUEBIRD HOUSE

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Woodworking for Wildlife

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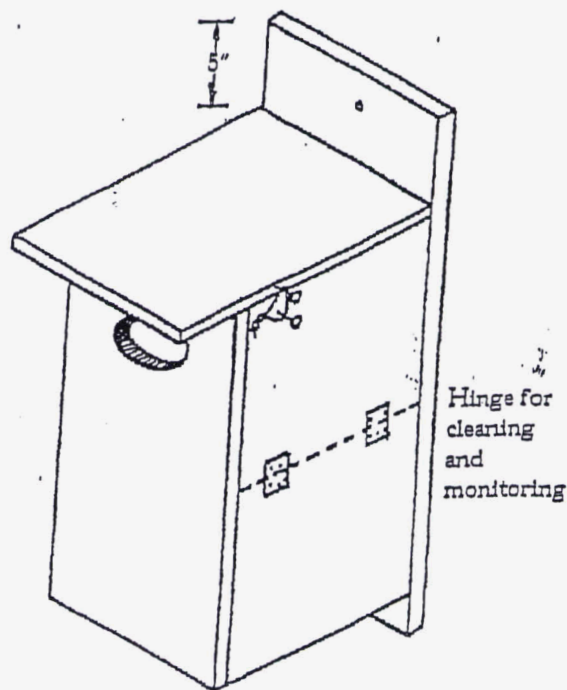
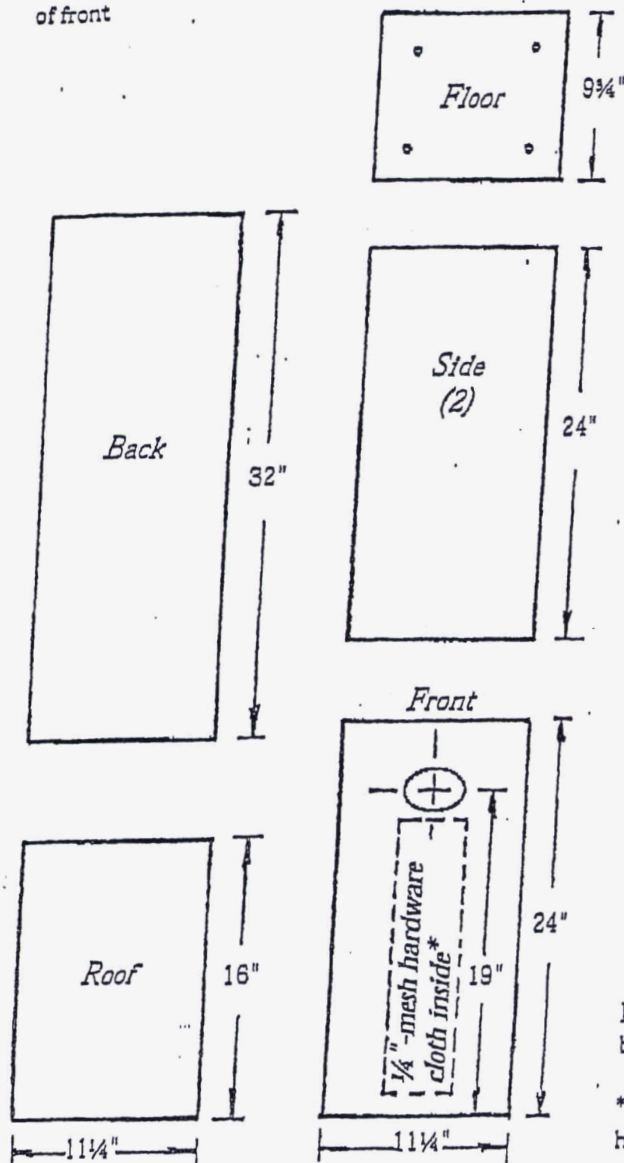
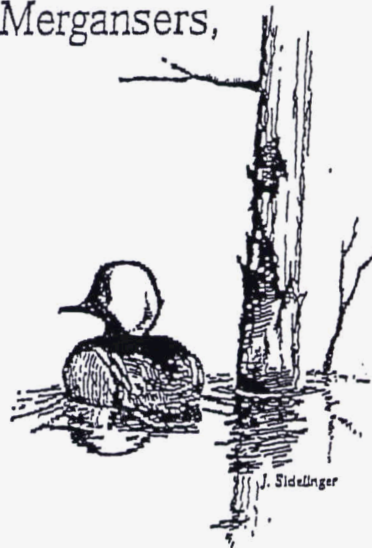


**BACK**

# A Nest-Box Plan for Common and Hooded Mergansers, Wood Ducks, and American Kestrels

## Entrance Holes

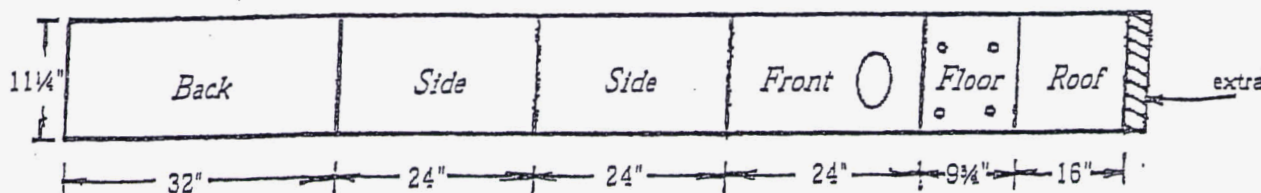
Common Merganser—minimum 5" diameter round  
 Wood Duck and Hooded Merganser—3"-high by 4"-wide oval  
 American Kestrel—3" diameter round, 4 1/2" down from top edge of front



Place 3 to 4 inches of wood shavings in bottom of box.

\*Ducklings need a "ladder" to provide toe-holds so they can climb out of nest box.

Lumber: One 1" x 12' x 12' 0"





# Nest Box 10

WOOD DUCK

HOODED MERGANSER

RACCOON

FOX and GRAY SQUIRREL

PILEATED WOODPECKER (?)



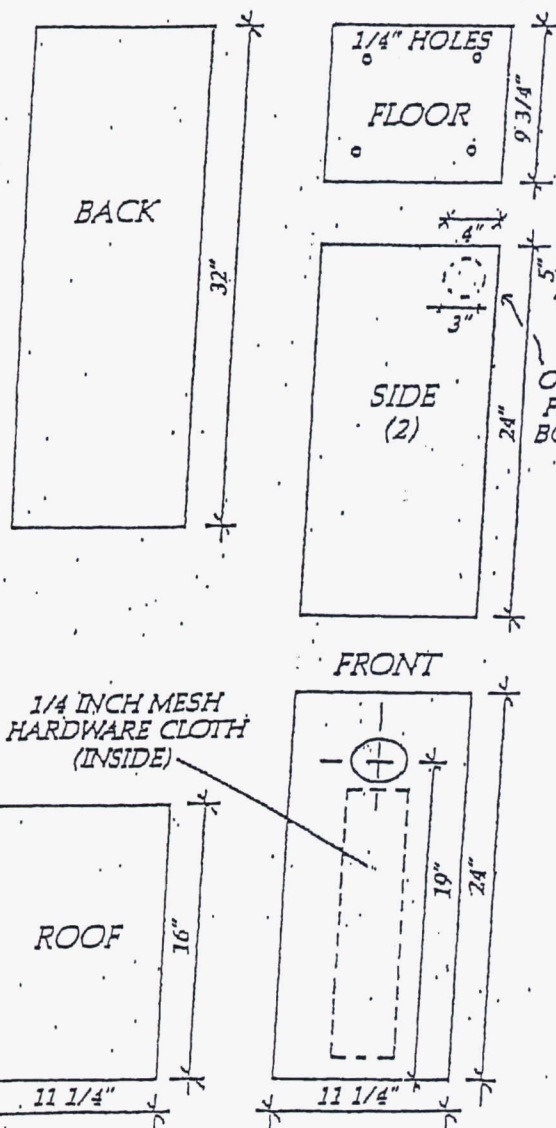
HOLE SIZE:  
(UP )

WOOD DUCK and HOODED MERGANSER:  
3" HIGH AND 4" WIDE OVAL

RACCOON:  
5" HIGH AND 9" WIDE OVAL

FOX and GRAY SQUIRREL:  
3" DIAMETER ROUND

PILEATED WOODPECKER:  
4" DIAMETER ROUND



OPTIONAL SITE  
FOR SQUIRREL  
BOX ENTRANCE

HINGE OR CLEAT  
ROOF FOR CLEANING

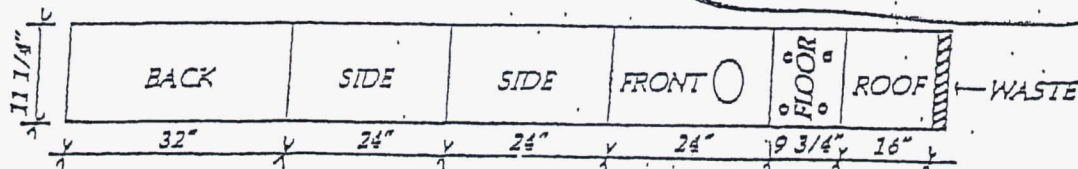
OPTIONAL:  
LOCATE 3" DIAMETER  
ENTRANCE HOLE HERE  
FOR SQUIRREL BOX

FOR WOOD DUCK HOUSE -  
PLACE 3/4" OF SAWDUST  
IN BOTTOM OF BOX

FOR PILEATED  
WOODPECKER HOUSE -  
FILL BOX TO TOP  
WITH SAWDUST

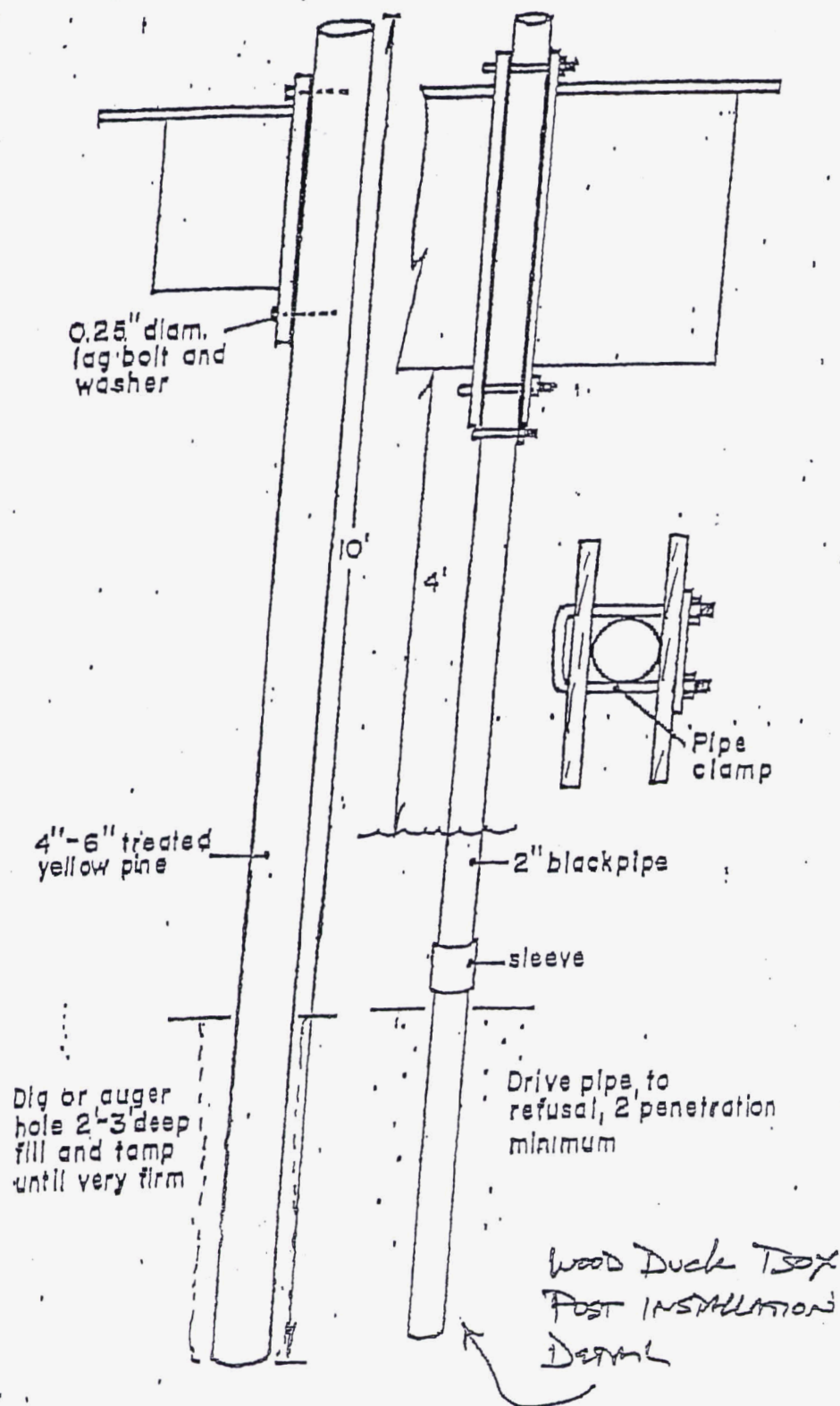
LUMBER: ONE 1" x 12" x 12'0"

NOTE: PILEATED WOODPECKER BOX SHOULD BE  
CONSTRUCTED FROM ONE 2" x 12" x 12'0" CEDAR, AND  
FLOOR MUST BE 8 1/4" LONG INSTEAD OF 9 3/4"  
FOR USE OF 1 1/2" THICK LUMBER





# POST INSTALLATION DETAIL



# FOX DEN STRUCTURE

## CROSS SECTIONS



Tunnel structure

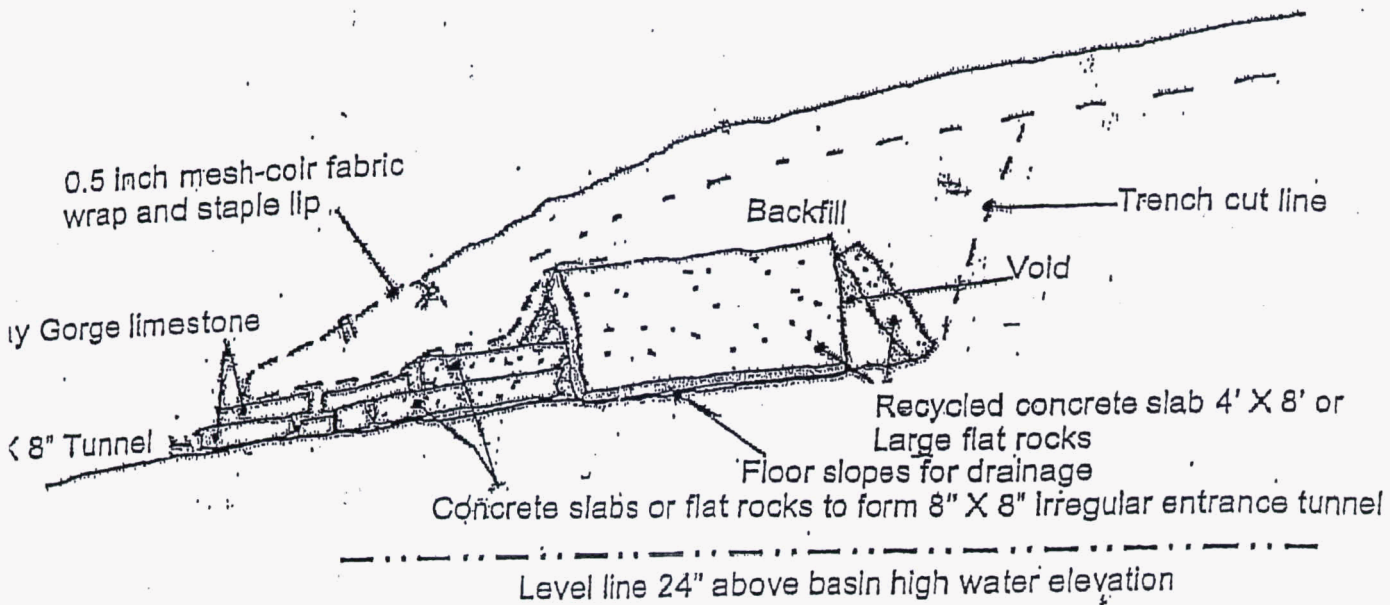


Visible entrance

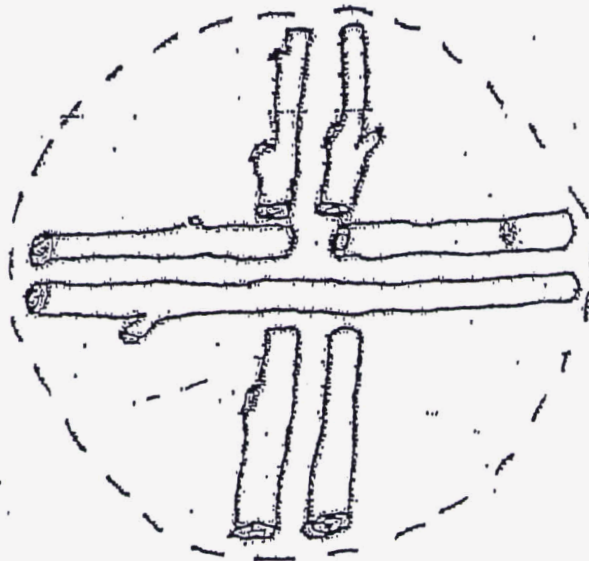


Den support structure

## SIDE VIEW



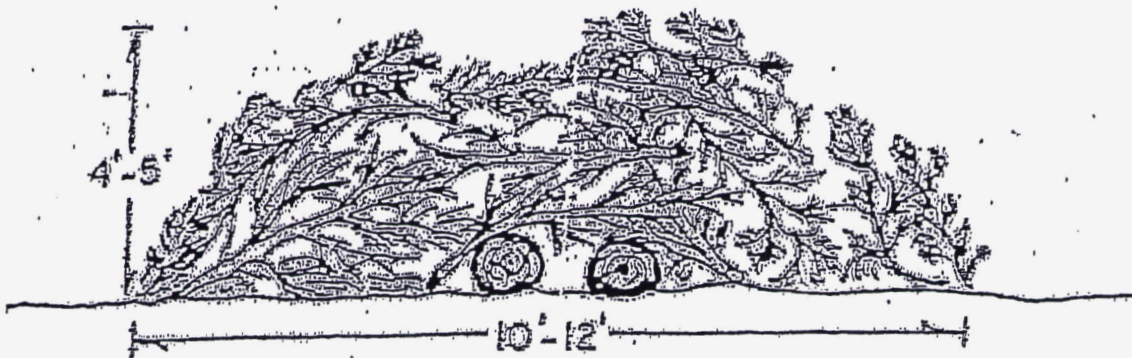
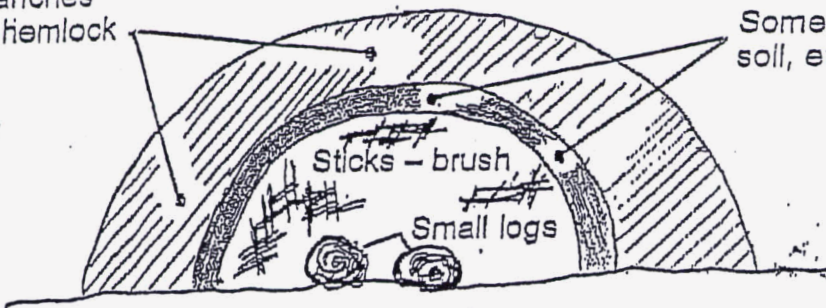
PLAN VIEW.



Log pattern

Evergreen branches  
Pine, Juniper, hemlock

Some straw, burlap,  
soil, etc.



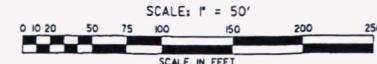


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MATCH LINE - SEE DWG 99X-5500-G-00950

MATCH LINE - SEE DWG 99X-5500-G-00951



PRELIMINARY  
NOT FOR CONSTRUCTION

### GENERAL NOTES

1. PLANTING WILL BE PERFORMED PER SPEC 02940.
2. SEEDING WILL BE PERFORMED PER OSD SPEC 02930.
3. SEE DRAWING 99X-5500-G-00944 FOR COMPLETE EXTENTS OF PLANTING AREA PATCH 1.

### LEGEND

#### PLANTING AREAS

- PATCH 1 - 2.2 ACRES
- PATCH 2 - 1.3 ACRES
- PATCH 3 - 1.0 ACRES
- TOTAL - 4.5 ACRES

A ISSUED FOR INTERNAL REVIEW		DATE	REV. BY	APPR.
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	INITIALS AND DATE		

UNITED STATES  
DEPARTMENT OF ENERGY  
FERNALD CLOSURE PROJECT

THIS DRAWING PREPARED BY  
**FLUOR FERNALD, INC.**



PROJECT NAME

DRAWING TITLE  
AREA 7 SILOS AND GENERAL AREA  
PLANTING PLAN  
SHEET 1 OF 3

#### APPROVALS

COGNIZANT ENG.	SAFETY ENG.		
CIVIL & STR.	MAINTENANCE		
ELECTRICAL	FIRE PROTECT.		
ENGINEER	WASTE MANAGE		
INSTRUMENT	SECURITY		
MECHANICAL	QA		
	CONSTRUCTION		

CHECKED	APPROVED	DRAWN BY	PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
		R.M. LINDGREN	20500	99X-5500-G-00949	G-5	A
RES PROJECT NO.	FLORNAME	99xg0949.dgn				



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## GENERAL NOTES

1. THIS DRAWING DEPICTS AN OVERALL VIEW OF AREA 7 SILOS AND GENERAL AREA. DETAILS FOR GRADING, CERTIFICATION BOUNDARIES, PLANTING AND SOIL AMENDMENT ARE PROVIDED ON SHEETS G-2 THRU G-12.
2. EXISTING TOPOGRAPHY TAKEN FROM CURRENT LIDAR SURVEY PERFORMED ON JANUARY 07, 2006.
3. HORIZONTAL CONTROL SHOWN ON DRAWING IS BASED UPON NORTH AMERICAN DATUM 1983 (NAD 83).
4. VERTICAL CONTROL SHOWN ON DRAWING IS BASED UPON NATIONAL GEODETIC VERTICAL DATUM 1929 (NGVD 1929).
5. BENEFICIAL REUSE AREA WILL BE DETAILED IN OTHER DESIGNS.

## CONSTRUCTION DRAWING INDEX

DRAWING NO.	DRAWING TITLE	SHEET NO.
99X-5500-G-00944	OVERALL RESTORATION GRADING PLAN	G-1
99X-5500-G-00945	RESTORATION GRADING PLAN SHEET 1 OF 2	G-2
99X-5500-G-00946	RESTORATION GRADING PLAN SHEET 2 OF 2	G-3
99X-5500-G-00947	SILOS PAD RESTORATION GRADING PLAN (CONCRETE TO REMAIN)	G-4
99X-5500-G-00949	PLANTING PLAN SHEET 1 OF 3	G-5
99X-5500-G-00950	PLANTING PLAN SHEET 2 OF 3	G-6
99X-5500-G-00951	PLANTING PLAN SHEET 3 OF 3	G-7
99X-5500-G-00952	SOIL AMENDMENT PLAN SHEET 1 OF 3	G-8
99X-5500-G-00953	SOIL AMENDMENT PLAN SHEET 2 OF 3	G-9
99X-5500-G-00954	SOIL AMENDMENT PLAN SHEET 3 OF 3	G-10

PRELIMINARY  
NOT FOR CONSTRUCTION

ISSUED FOR INTERNAL REVIEW	DATE	REV. BY	APPR.
ISSUE OR REVISION PURPOSE - DESCRIPTION	INITIALS AND DATE		

UNITED STATES  
DEPARTMENT OF ENERGY  
FERNALD CLOSURE PROJECT

THIS DRAWING PREPARED BY

**FLUOR FERNALD, INC.**



PROJECT NAME

SOIL REMEDIATION

DRAWING TITLE

AREA 7 SILOS AND GENERAL AREA  
OVERALL RESTORATION GRADING PLAN

## APPROVALS

COORDINANT ENG.	SAFETY ENG.
CIVIL & STR.	MAINTENANCE
ELECTRICAL	FIRE PROTECT.
ENGINEER	WASTE MANAGE
INSTRUMENT	SECURITY
MECHANICAL	QA
	CONSTRUCTION

CHECKED  
APPROVED

DRAWN BY R.M. LINDGREN	PROJECT NO. 20500	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
RES PROJECT NO.	FILENAME 39xg0944.dgn	99X-5500-G-00944	G-1	A



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### GENERAL NOTES

- EXISTING TOPOGRAPHY TAKEN FROM CURRENT LIDAR SURVEY PERFORMED ON JANUARY 07, 2006.
- HORIZONTAL CONTROL SHOWN ON DRAWING IS BASED UPON NORTH AMERICAN DATUM 1983 (NAD 83).
- VERTICAL CONTROL SHOWN ON DRAWING IS BASED UPON NATIONAL GEODETIC VERTICAL DATUM 1929 (NGVD 1929).
- CONSTRUCTION MANAGER SHALL VERIFY EXISTING TOPOGRAPHY CONDITIONS PRIOR TO CONSTRUCTION.
- EXCAVATE DEPRESSIONS, RESTORATION DITCHES, AND PONDS IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 02200. COMPACT BERMS AND EMBANKMENT FILL TO 90 PERCENT OF STANDARD PROCTOR, MAXIMUM DRY DENSITY.

### LEGEND

---	EXISTING CONTOUR
---	PROPOSED CONTOUR
	RR TRACKS
-.-.-	FENCE
-.-.-	CERTIFICATION BOUNDARY
~	FLOW DIRECTION

A ISSUED FOR INTERNAL REVIEW			
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY
		INITIALS AND DATE	

**UNITED STATES  
DEPARTMENT OF ENERGY**

**FERNALD CLOSURE PROJECT**

THIS DRAWING PREPARED BY

**FLUOR FERNALD, INC.**

PROJECT NAME

DRAWING TITLE

**AREA 7 SILOS AND GENERAL AREA  
RESTORATION GRADING PLAN  
SHEET 1 OF 2**

APPROVALS	
COORDINANT ENG.	SAFETY ENG.
CIVIL & STR.	MAINTENANCE
ELECTRICAL	FIRE PROTECT.
ENGINEER	WASTE MANAGE.
INSTRUMENT	SECURITY
MECHANICAL	GA
	CONSTRUCTION

CHECKED	APPROVED	PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
DRAWN BY	R.M. LINDGREN	20500		G-2	A
REV. PROJECT NO.	99xg0945.dgn				

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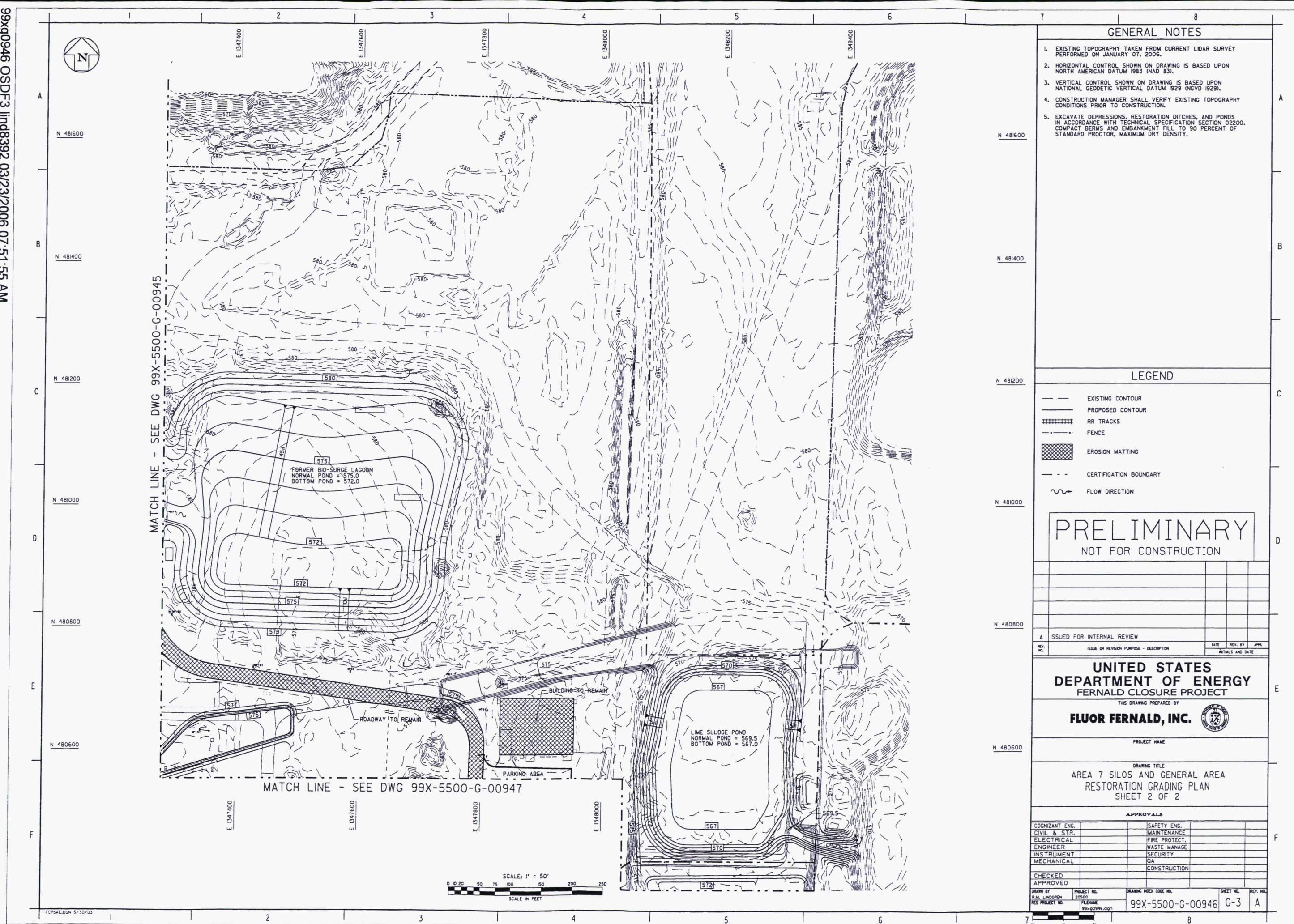
SCALE IN FEET

**PRELIMINARY**

NOT FOR CONSTRUCTION

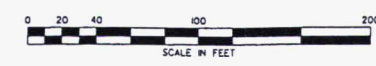
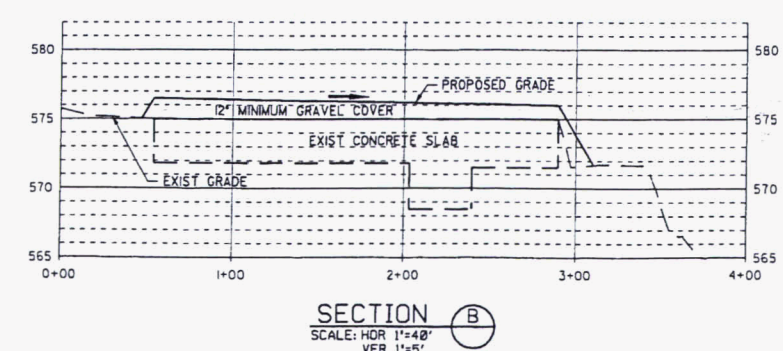
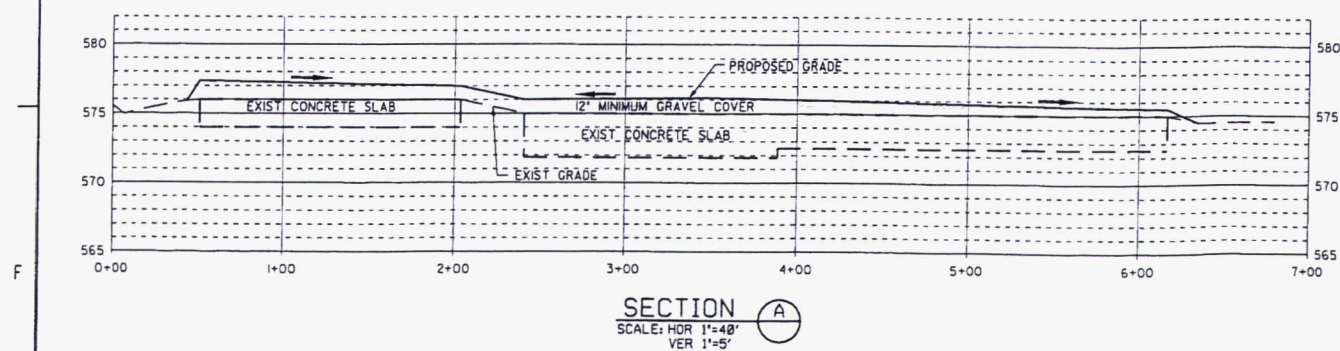
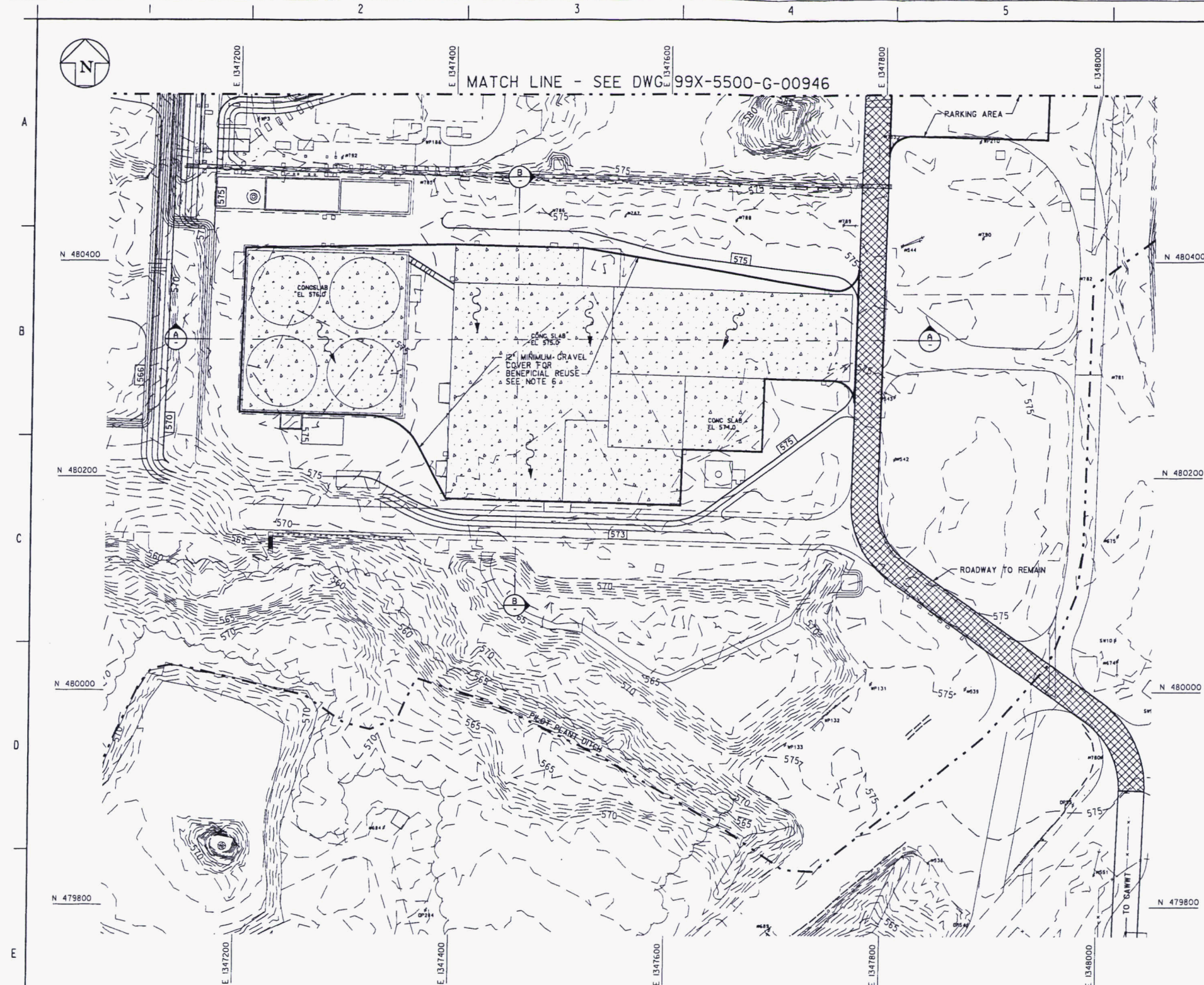


99x0946 OSD F3 lind8392 03/23/2006 07:51:55 AM





99x0947 OSD.F3 lind8392 03/23/2006 07:52:23 AM



### GENERAL NOTES

1. EXISTING TOPOGRAPHY TAKEN FROM CURRENT LIDAR SURVEY PERFORMED ON JANUARY 07, 2006.
2. HORIZONTAL CONTROL SHOWN ON DRAWING IS BASED UPON NORTH AMERICAN DATUM 1983 (NAD 83).
3. VERTICAL CONTROL SHOWN ON DRAWING IS BASED UPON NATIONAL GEODETIC VERTICAL DATUM 1929 (NGVD 1929).
4. CONSTRUCTION MANAGER SHALL VERIFY EXISTING TOPOGRAPHY CONDITIONS PRIOR TO CONSTRUCTION.
5. EXCAVATE DEPRESSIONS, RESTORATION DITCHES, AND PONDS IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 02200. COMPACT BERMS AND EMBANKMENT FILL TO 90 PERCENT OF STANDARD PROCTOR, MAXIMUM DRY DENSITY.
6. GRAVEL SHALL BE 000T 304 AGGREGATE OR APPROVED EQUAL AND PLACED IN ACCORDANCE WITH TECHNICAL SPECIFICATION 02230.

**PRELIMINARY**  
NOT FOR CONSTRUCTION

A ISSUED FOR INTERNAL REVIEW		DATE	REV. BY	APPR.
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	INITIALS AND DATE		

### UNITED STATES DEPARTMENT OF ENERGY FERNALD CLOSURE PROJECT

THIS DRAWING PREPARED BY  
**FLUOR FERNALD, INC.**

PROJECT NAME

DRAWING TITLE

**SILOS PAD RESTORATION  
GRADING PLAN (CONCRETE TO REMAIN)**

#### APPROVALS

COGNIZANT ENG.	SAFETY ENG.		
CIVIL & STR.	MAINTENANCE		
ELECTRICAL	FIRE PROTECT.		
ENGINEER	WASTE MNGT.		
INSTRUMENT	SECURITY		
MECHANICAL	QA		
	CONSTRUCTION		

CHECKED	APPROVED	PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
DRN BY	FLUOR FERNALD	20500			
REV PROJECT NO.	FILE NAME	99x0547.dgn	99X-5500-G-00947	G-4	A



39xg0951 OSD-F3 lnd8392 03/23/2006 07:53:56 AM



# GENERAL NOTES

1. PLANTING WILL BE PERFORMED PER SPEC 02940.
2. SEEDING WILL BE PERFORMED PER OSDF SPEC 02930.

## LEGEND

--- CERTIFICATION BOUNDARY

A ISSUED FOR INTERNAL REVIEW			
REV. NO.	ISSUE	REVISION PURPOSE - DESCRIPTION	DATE REV. BY APPL. INITIALS AND DATE

## UNITED STATES DEPARTMENT OF ENERGY FERNALD CLOSURE PROJECT

THIS DRAWING PREPARED BY

**FLUOR FERNALD, INC.**



PROJECT NAME

DRAWING TITLE  
AREA 7 SILOS AND GENERAL AREA  
PLANTING PLAN  
SHEET 3 OF 3

### APPROVALS

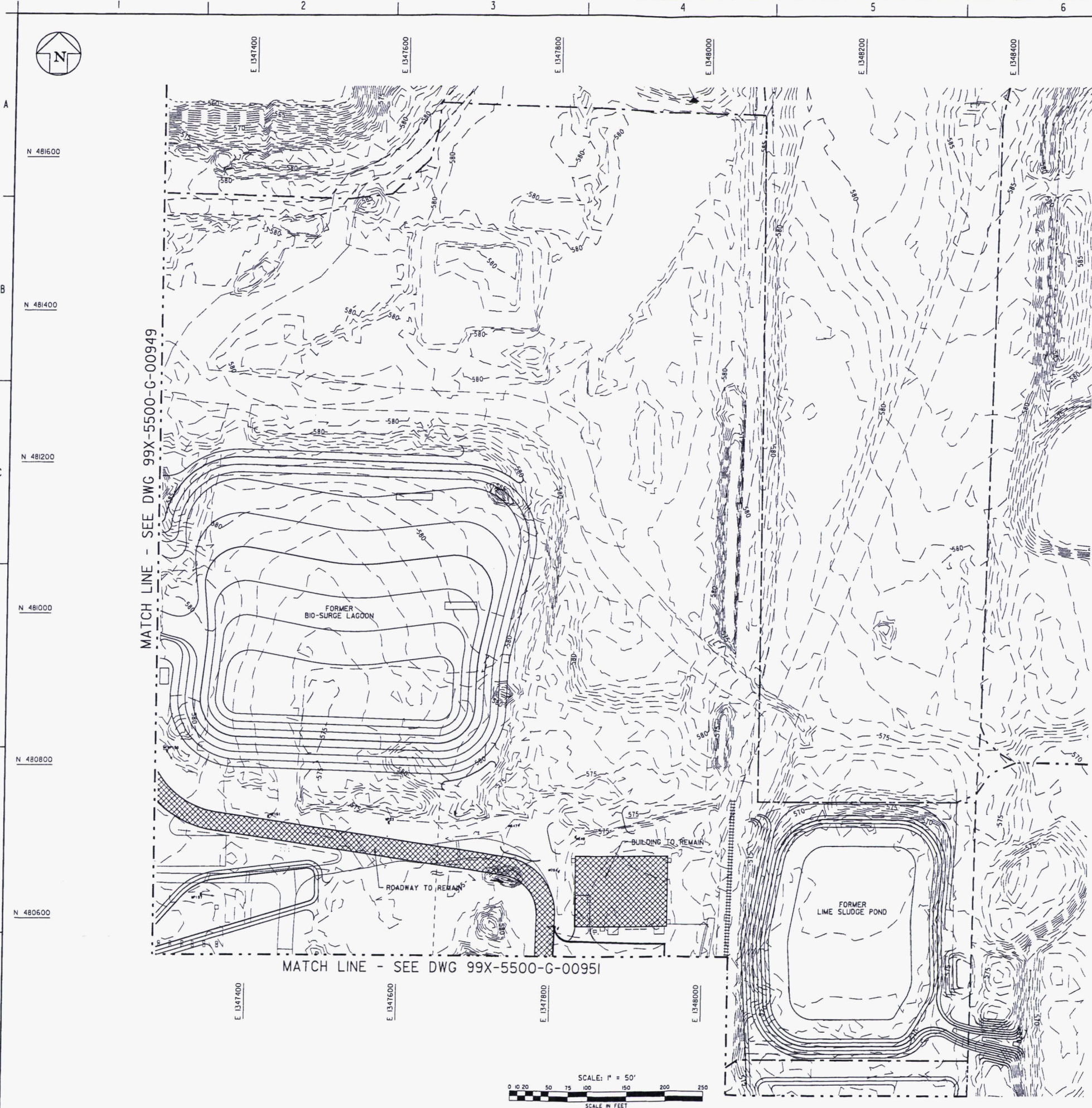
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CIVIL & STR.	MAINTENANCE		
ELECTRICAL	FIRE PROTECT.		
ENGINEER	WASTE MANAGE		
INSTRUMENT	SECURITY		
MECHANICAL	QA		
	CONSTRUCTION		

CHECKED  
APPROVED

DRAWN BY R.A. LINDGREN	PROJECT NO. 20500	DRAWING INDEX CODE NO. 99X-5500-G-00951	SHEET NO. G-7	REV. NO. A
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39xg0950 OSDf3 lind8392 03/23/2006 07:53:31 AM



GENERAL NOTES

1. PLANTING WILL BE PERFORMED PER SPEC 02940.
2. SEEDING WILL BE PERFORMED PER OSDF SPEC 02930.

LEGEND

--- CERTIFICATION BOUNDARY

PRELIMINARY  
NOT FOR CONSTRUCTION

UNITED STATES  
DEPARTMENT OF ENERGY  
FERNALD CLOSURE PROJECT

THIS DRAWING PREPARED BY  
**FLUOR FERNALD, INC.**

PROJECT NAME

DRAWING TITLE  
AREA 7 SILOS AND GENERAL AREA  
PLANTING PLAN  
SHEET 2 OF 3

APPROVALS

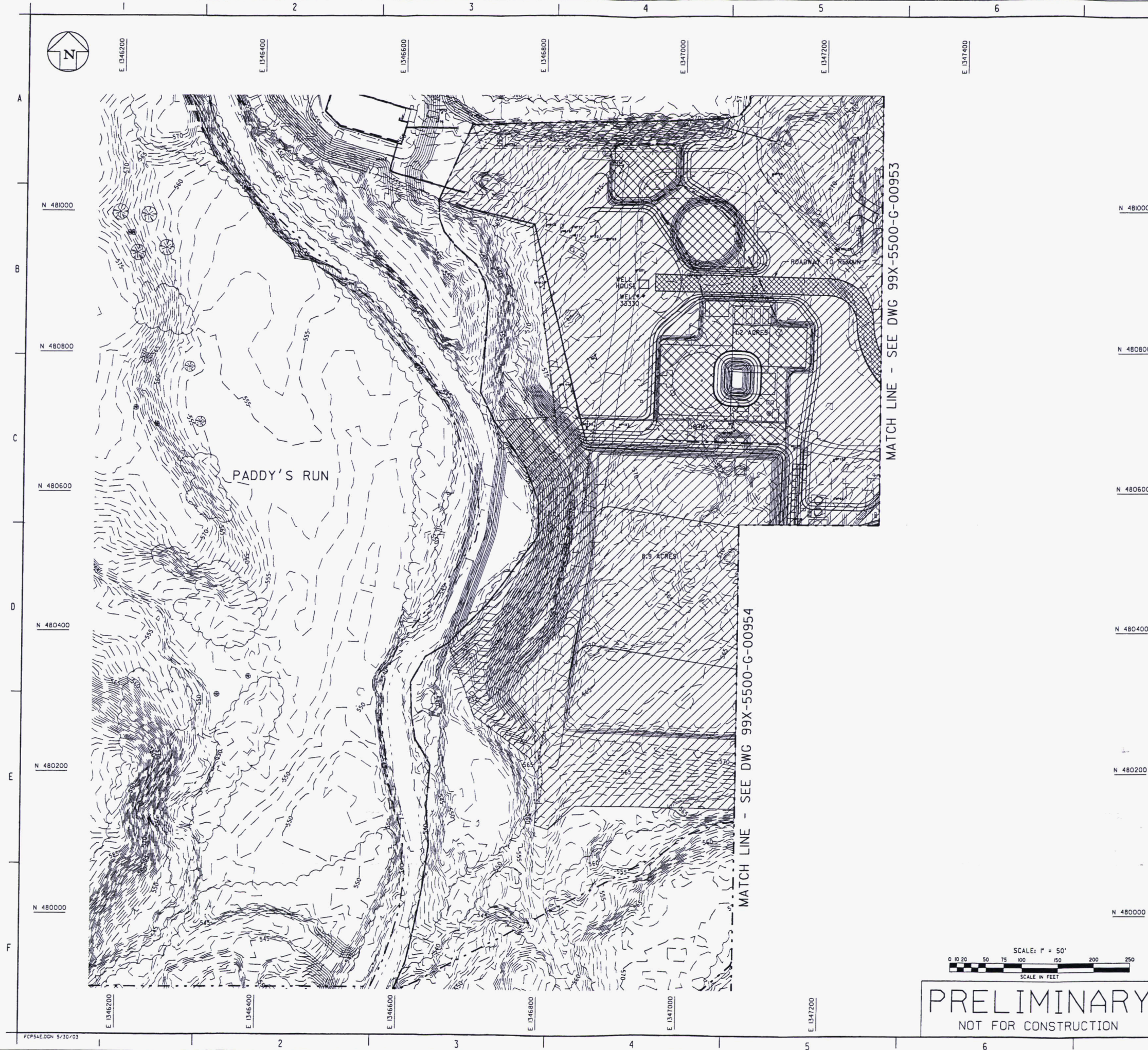
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CIVIL & STR.	MAINTENANCE
ELECTRICAL	FIRE PROTECT.
ENGINEER	WASTE MANAGE.
INSTRUMENT	SECURITY
MECHANICAL	QA
	CONSTRUCTION

CHECKED  
APPROVED

DRAWN BY: R.M. LINDGREN  
PROJECT NO.: 20500  
FILENAME: 99xg0950.dgn  
DRAWING INDEX CODE NO.: 99X-5500-G-00950  
SHEET NO.: G-6  
REV. NO.: A



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GENERAL NOTES

1. NO AMENDMENT IN PONDS BELOW SPILLWAY WATER LEVELS.
2. SURFACE APPLICATION ONLY IN WETLANDS.
3. BERMS AND PERIMETER REQUIRE FULL AMENDMENT IF TOPSOIL IS NOT PRESENT.

LEGEND

- N.A. - NO AMENDMENT  
TOTAL ACREAGE = 0.1 ACRES
- S.O. - SURFACE APPLICATION ONLY  
TOTAL ACREAGE = 1.2 ACRES
- S.A. - SOIL AMENDMENT REQUIRED  
TOTAL ACREAGE = 8.9 ACRES
- - - CERTIFICATION BOUNDARY

A		ISSUED FOR INTERNAL REVIEW				
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION			DATE	REV. BY	APPL.
				INITIALS AND DATE		

UNITED STATES  
DEPARTMENT OF ENERGY  
FERNALD CLOSURE PROJECT

THIS DRAWING PREPARED BY  
**FLUOR FERNALD, INC.**

PROJECT NAME  
  
DRAWING TITLE  
AREA 7 SILOS AND GENERAL AREA  
SOIL AMENDMENT PLAN  
SHEET 1 OF 3

APPROVALS			
COGNIZANT ENG.		SAFETY ENG.	
CIVIL & STR.		MAINTENANCE	
ELECTRICAL		FIRE PROTECT.	
ENGINEER		WASTE MANAGE	
INSTRUMENT		SECURITY	
MECHANICAL		QA	
		CONSTRUCTION	

CHECKED				
APPROVED				
DRAWN BY	P.M. LINDGREN	PROJECT NO.	20500	
REV. PROJECT NO.		FILE NAME	99xg0952.dgn	
		DRAWING INDEX CODE NO.	99X-5500-G-00952	
		SHEET NO.	G-8	
		REV. NO.	A	



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N 481600

N 481400

N 481200

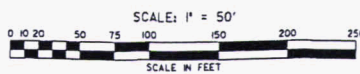
N 481000

N 480800

N 480600

MATCH LINE - SEE DWG 99X-5500-G-00952

MATCH LINE - SEE DWG 99X-5500-G-00954



## GENERAL NOTES

1. NO AMENDMENT IN PONDS BELOW SPILLWAY WATER LEVELS.
2. SURFACE APPLICATION ONLY IN WETLANDS.
3. BERMS AND PERIMETER REQUIRE FULL AMENDMENT IF TOPSOIL IS NOT PRESENT.

## LEGEND



N.A. - NO AMENDMENT  
TOTAL ACREAGE = 1.7 ACRES



S.O. - SURFACE APPLICATION ONLY  
TOTAL ACREAGE = 4.1 ACRES



S.A. - SOIL AMENDMENT REQUIRED  
TOTAL ACREAGE = 16.6 ACRES

--- CERTIFICATION BOUNDARY

**PRELIMINARY**  
NOT FOR CONSTRUCTION

REV. NO.		ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APP.
A		ISSUED FOR INTERNAL REVIEW			

**UNITED STATES  
DEPARTMENT OF ENERGY**  
FERNALD CLOSURE PROJECT

THIS DRAWING PREPARED BY

**FLUOR FERNALD, INC.**



PROJECT NAME

DRAWING TITLE  
**AREA 7 SILOS AND GENERAL AREA  
SOIL AMENDMENT PLAN  
SHEET 2 OF 3**

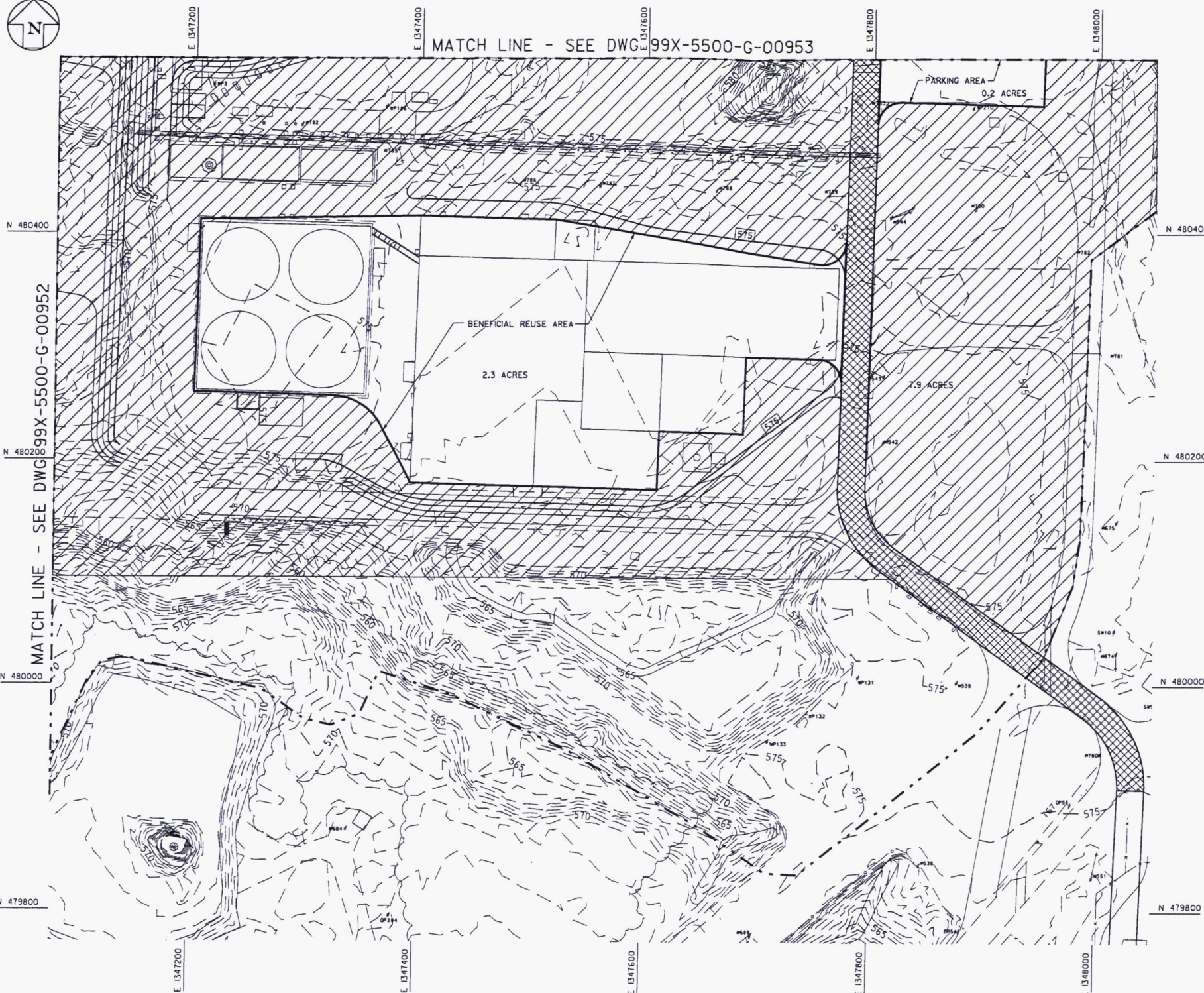
## APPROVALS

COGNIZANT ENG.		SAFETY ENG.	
CIVIL & STR.		MAINTENANCE	
ELECTRICAL		FIRE PROTECT.	
ENGINEER		WASTE MANAGE	
INSTRUMENT		SECURITY	
MECHANICAL		QA	
		CONSTRUCTION	

CHECKED		PROJECT NO.	20500	DRAWING INDEX CODE NO.		SHEET NO.	REV. NO.
APPROVED		RES PROJECT NO.	99X-5500-G-00953	FILENAME	99xg0953.dgn	G-9	A



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## GENERAL NOTES

1. NO AMENDMENT IN PONDS BELOW SPILLWAY WATER LEVELS.
2. SURFACE APPLICATION ONLY IN WETLANDS.
3. BERMS AND PERIMETER REQUIRE FULL AMENDMENT IF TOPSOIL IS NOT PRESENT.

## LEGEND



N.A. - NO AMENDMENT  
TOTAL ACREAGE = 2.5 ACRES



S.A. - SOIL AMENDMENT REQUIRED  
TOTAL ACREAGE = 7.9 ACRES

--- CERTIFICATION BOUNDARY

A	ISSUED FOR INTERNAL REVIEW	DATE	REV. BY	APPR.
REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	INITIALS AND DATE		

UNITED STATES  
DEPARTMENT OF ENERGY  
FERNALD CLOSURE PROJECT

THIS DRAWING PREPARED BY

FLUOR FERNALD, INC.



PROJECT NAME

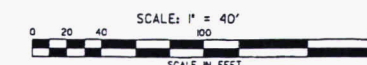
DRAWING TITLE  
AREA 7 SILOS AND GENERAL AREA  
SOIL AMENDMENT PLAN  
SHEET 3 OF 3

## APPROVALS

COGNIZANT ENG.	SAFETY ENG.		
CIVIL & STR.	MAINTENANCE		
ELECTRICAL	FIRE PROTECT.		
ENGINEER	WASTE MANAGE.		
INSTRUMENT	SECURITY		
MECHANICAL	QA		
	CONSTRUCTION		

CHECKED			
APPROVED			

DRAWN BY R.M. LINDGREN	PROJECT NO. 20500	DRAWING INDEX CODE NO. 99X-5500-G-00954	SHEET NO. G-10	REV. NO. A
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PRELIMINARY  
NOT FOR CONSTRUCTION